FEBRUARY, 1953 — FIFTY-NINTH YEAR

MACHINERY

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with the first drafting
machine—today

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BOARDMASTER

leads in use wherever precision, visibility, ease of performance and adaptability to angle boards are decisive purchasing factors.

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Bulletin

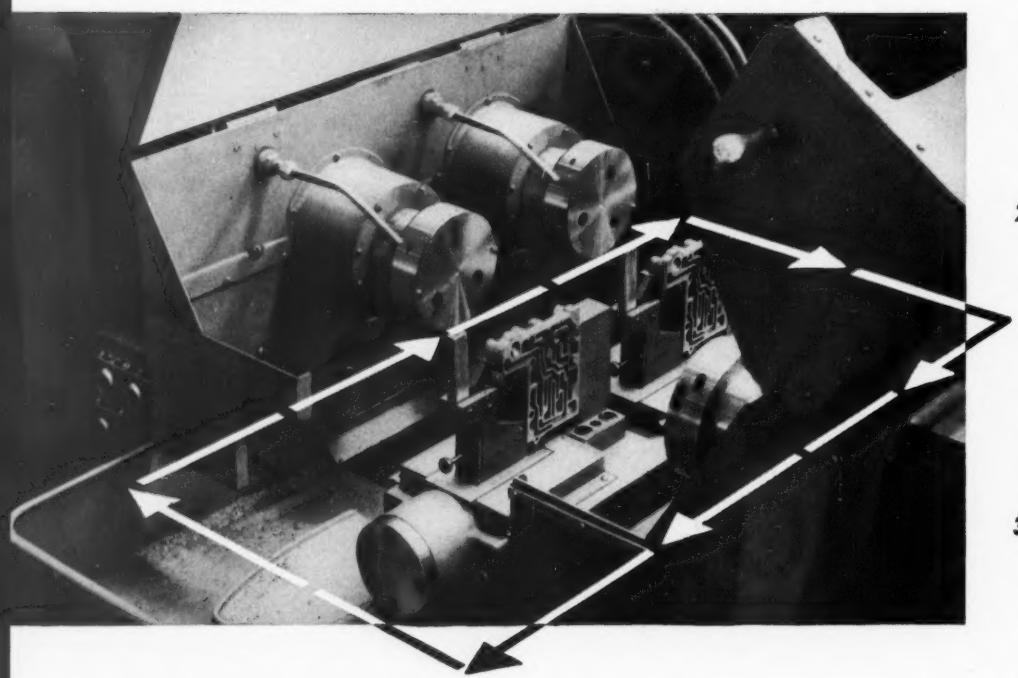
LOOK FOR THE 360° FULL-VISION PROTRACTOR

UNIVERSAL DRAFTING MACHINE COMPANY • CLEVELAND, OHIO

Heald Bore-Matic speeds

FLY-CUTTING

... gives extra precision, too

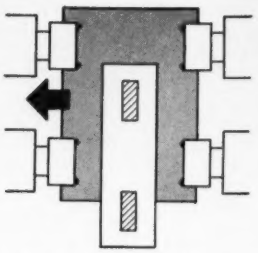


Valve bodies fly-cut on both sides, two parts at a time, in fully automatic high-speed cycle

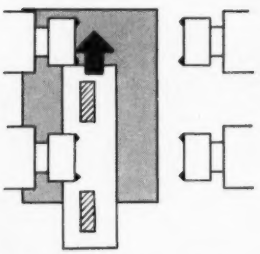
● Many people think of a Heald Bore-Matic only in terms of the conventional boring, facing, turning and chamfering operations. Yet these versatile machines can be equally well applied to a wide variety of other operations — take fly-cutting for example.

Here a model 222 Heald Bore-Matic combines fast automatic cycling with characteristic high precision. Two valve bodies are fly-cut simultaneously as they are indexed past the rotating quills with double tools mounted in the face. The machine is fully automatic, finishing both sides of two parts in a single machine cycle.

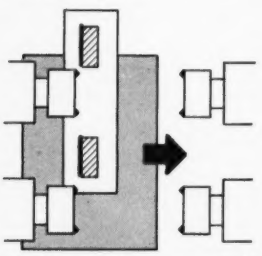
Remember — when it comes to precision finishing, it pays to come to Heald.



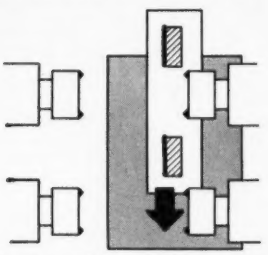
1. Parts loaded. Table rapid traverses left.



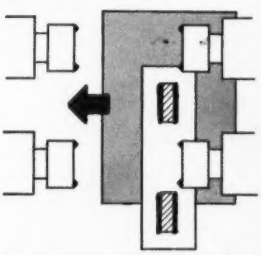
2. Cross slide feeds to rear. Heads fly-cut.



3. Table rapid traverses right.



4. Cross slide feeds forward. Heads fly-cut.



5. Table rapid traverses left to unloading position.

HEALD

Case Study No. 2232-96 in **PRECISION PRODUCTION**

INTERNAL AND ROTARY SURFACE GRINDING MACHINES AND BORE-MATICS

THE HEALD MACHINE COMPANY

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MACHINERY

VOLUME 59 **FEBRUARY, 1953** NUMBER 6

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How The Slaysman Company

LANDIS *Machine* COMPANY

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF

Reduced Threading Time 97%

MR. ALEXANDER S. SMICK, President of the Slaysman Company, large machine shop and parts sub-contractor in Baltimore, said in a field interview: "Our LANDIS machine reduced threading time on this particular job from 2 hours to 4 minutes and made savings on every other job run on it."

The "particular job" referred to by Mr. Smick was a contract involving the cutting of a 1" diameter 5 pitch Acme thread 29" long on C1141 steel to a Class 3 fit. Original production plans were to generate the thread by milling. At the same time, even though the specifications and the hardness of the material seemed to preclude other methods, we were asked if we could suggest a more efficient threading process.

Based on our recommendation after studying the thread specifications, a 1½" LANDMACO Single Head Leadscrew Machine with an extra-long carriage was installed. The LANCO threading head was equipped with centering throat chasers with a roughing and finishing thread form. Centering throat chasers produce threads concentric with the outside diameter, and eliminate the out-of-round condition that often occurs when threading extra-long workpieces. The roughing and finishing thread form chasers cut coarse pitch threads with excellent finish in one pass.

Not only did this method reduce threading time from 2 hours to 4 minutes, but it also produced a very economical 50 pieces between chaser grinds. This is particularly impressive when it is remembered that the thread was 29 inches long and the hardness of the material threaded was near the limits of machineability.

This is not a single outstanding case. While results here were somewhat unusual because of the size of the saving, many other LANDIS machines have made significant savings producing all types of threads. Perhaps we may help YOU make similar economies in your Thread Production.

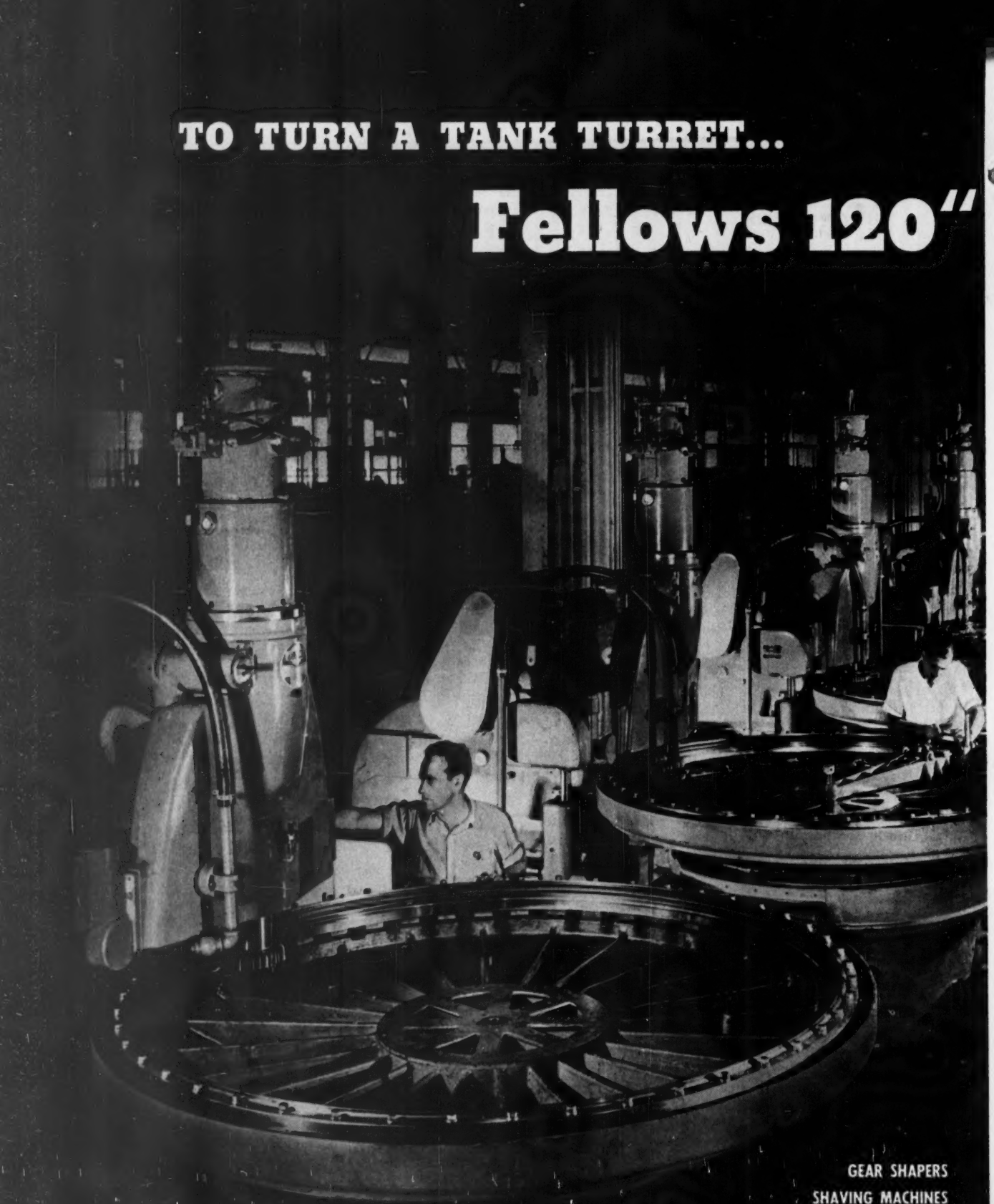
50TH ANNIVERSARY

WAYNESBORO PENNSYLVANIA

THREAD GENERATING EQUIPMENT

TO TURN A TANK TURRET...

Fellows 120"



GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

NADEL

Cuts a Giant Gear

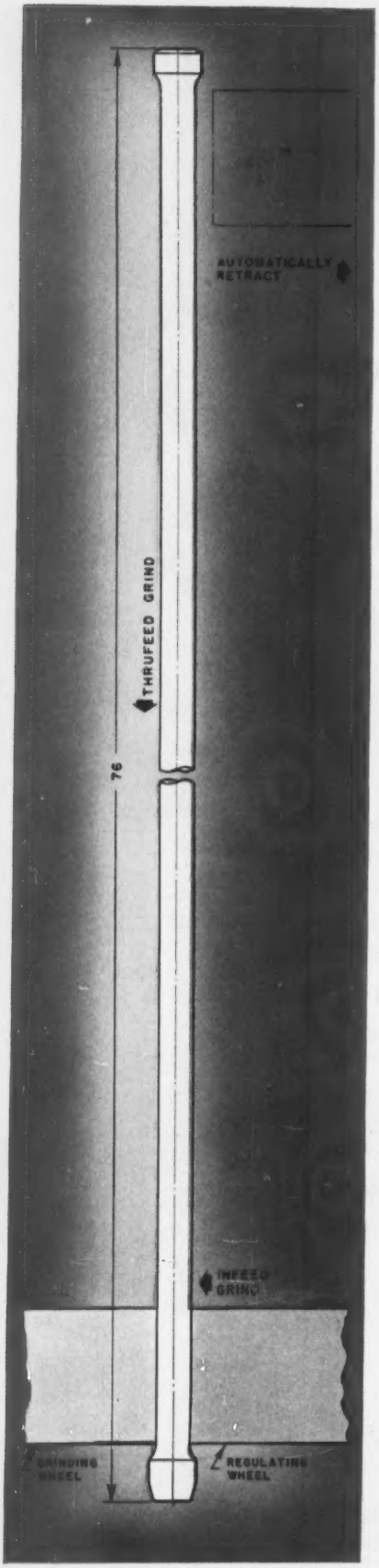
At the Chrysler Delaware Tank Plant, tank turret gears are accurately finish-cut with six Fellows 120" Gear Shapers. Here are some of the reasons:

Only a minimum of set-up time is required on the Fellows 120-Inch. Fixtures are rigidly supported and readily accessible, resulting in increased cutting feeds and a saving of work handling time. Gears are roughed and finished in two cuts at one setting of the work. Tool maintenance costs are low, because cutters can be sharpened on any standard rotary surface grinder.

For intermediate, or larger gears, the speed and precision of the Fellows 36-Type, 48-Inch, or 100-Inch Gear Shapers may be the answer to your gearing problems. To learn how, write or call the Fellows office nearest you.

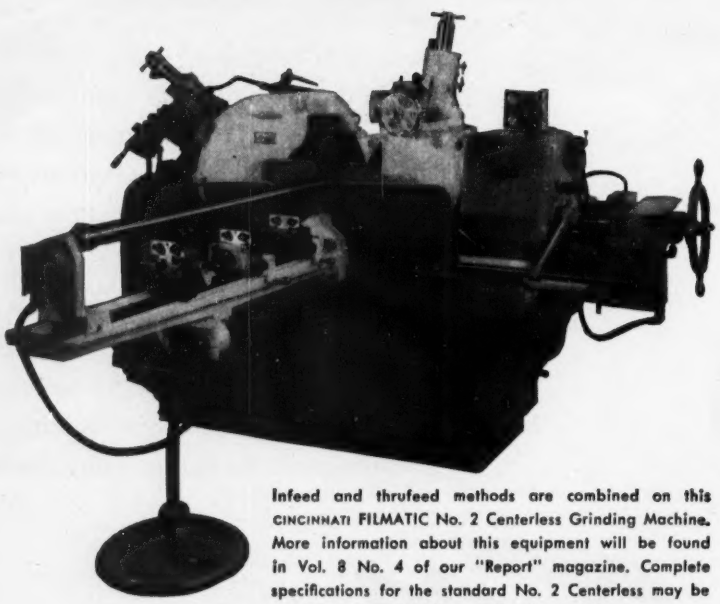
Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont
Branch Offices: 323 Fisher Bldg., Detroit 2 • 5835 West North Avenue, Chicago 39 • 2206 Empire State Bldg., New York 1



Upsetting a Centerless Tradition

...AND SAVING



Infeed and thrufeed methods are combined on this CINCINNATI FILMATIC No. 2 Centerless Grinding Machine. More information about this equipment will be found in Vol. 8 No. 4 of our "Report" magazine. Complete specifications for the standard No. 2 Centerless may be obtained by writing for catalog No. G-611.

CINCINNATI

CINCIN

TIME

Grinding long torsion bars with upset ends by the thrufeed method on a CINCINNATI FILMATIC No. 2 Centerless Grinder.

"Thrufeed grinding is applicable to straight cylindrical work." So goes the handbook description of centerless grinding. The equipment illustrated here upsets this restriction on the centerless method; it thrufeed grinds the center section of torsion bars having upset ends. ¶Cincinnati Application Engineers tooled up a CINCINNATI FILMATIC No. 2 Centerless Grinder with a modified long bar attachment and power advance and retraction of the regulating wheel slides. Movement of the slides is 1", pneumatically controlled. A short length next to one shoulder is infeed ground to size, the long center section is thruteed ground to the opposite shoulder, and then the regulating wheel slides automatically retract. An end stop prevents traverse motion of the work while infeed grinding, and retractable roller brackets support the work while thrufeed grinding. ¶ Score another first in low-cost precision grinding by Cincinnati Engineers. Chances are they can help you reduce costs with new equipment and new methods. Of course, CINCINNATI FILMATIC Centerless Grinders are in short supply at this time, but it's a good idea to see what can be done today. When writing, include blueprint of work.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

FILMATIC

NATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

Introducing

The New Revolutionary

VAN NORMAN 418 CYLINDRICAL GRINDER

Since 1912, Van Norman has pioneered in the design and development of precision grinders. *Now* Van Norman brings you the new, outstanding 418 Cylindrical Grinder for fast, economical "close-tolerance" grinding of small parts. And at an unbelievably low price.

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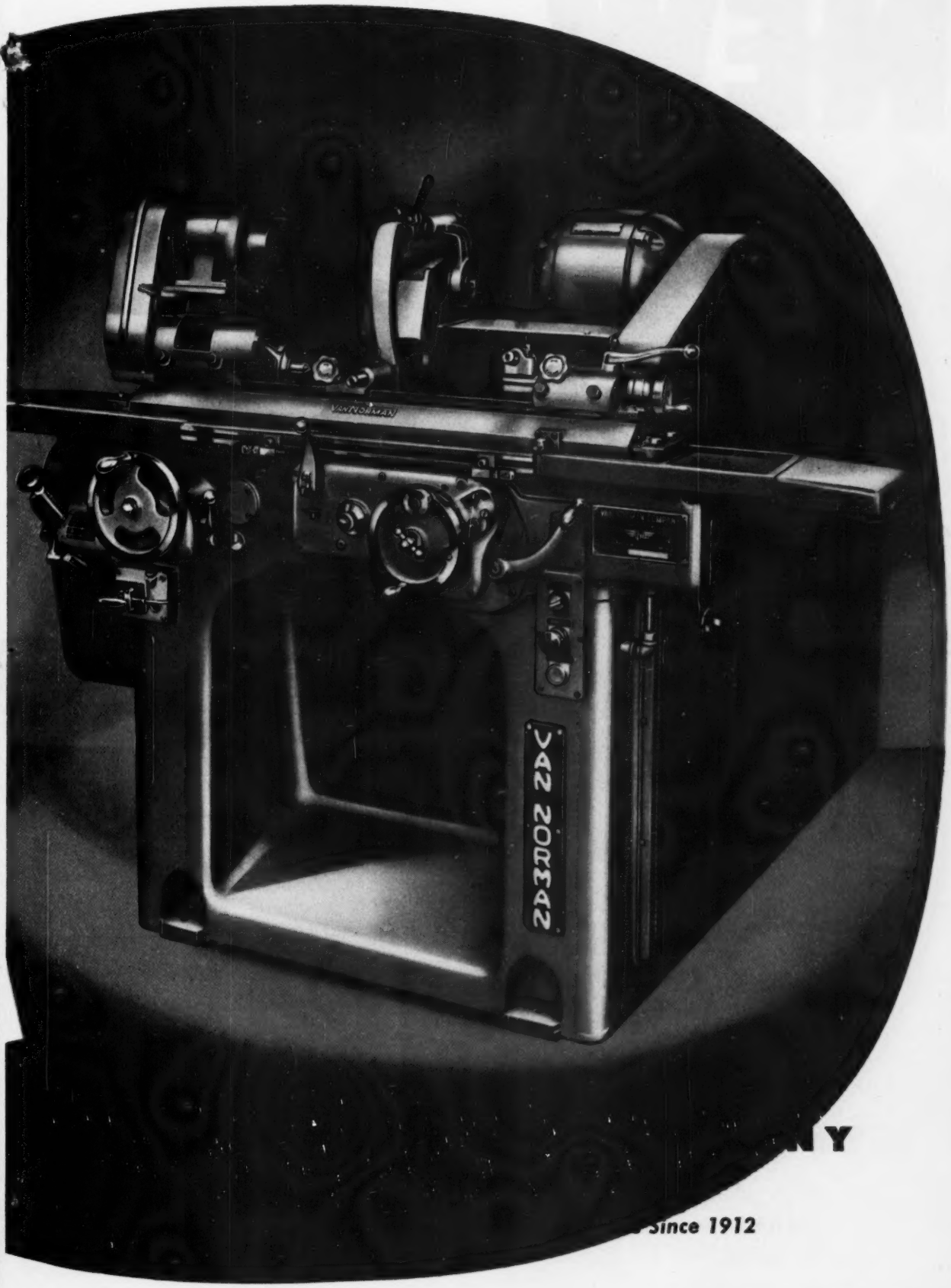
- Easily and conveniently operated
- Controls located and grouped for maximum operator efficiency
- Minimum floor space needed, only 43½" x 79¼"
- Grinding wheel speeds 1772 and 2067 RPM
- Wheel spindle, slide and slide base well proportioned and constructed for rigidity and maximum accuracy
- Headstock work speeds 153 to 940 RPM
- Maximum grinding diameter 4"
- Automatic lubrication

WRITE FOR COMPLETE DETAILS TODAY. ESPECIALLY INQUIRE ABOUT THE PRICE. IT'S EXCEPTIONALLY LOW.



Y

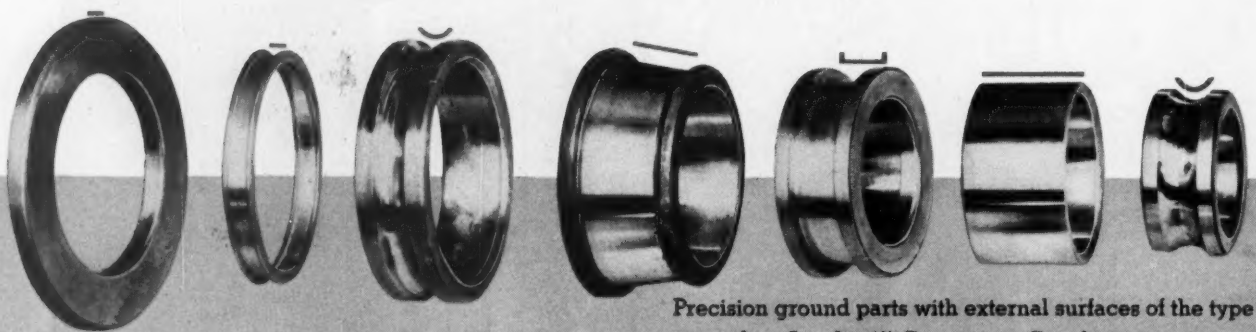
Since 1912

NEW

• Landis 4" Concentric Grinder
• Work Holding Method

Grinds External Surface Concentric to

Produces Precision Grinding Results at Commercial Grinding Costs



Precision ground parts with external surfaces of the type ground on Landis 4" Concentric Grinders.

Super Precision Tolerances—to low limits for

- Concentricity of external surface with bore
- Parallelism of profile with face

High Production—automatic operation for

- Straight surfaces
- Profiled surfaces
- Tapered surfaces

Extra grinding operations often can be eliminated by this new method. Production estimates and tooling suggestions will be made on the basis of your blueprints. Send for new Bulletin CX-52.

LANDIS TOOL COMPANY / WAYNESBORO, PENNA., U. S. A.

NADEL

Bore . . . *Automatically*

Operator loading work chute on Landis 4" Concentric Grinder.

LANDIS

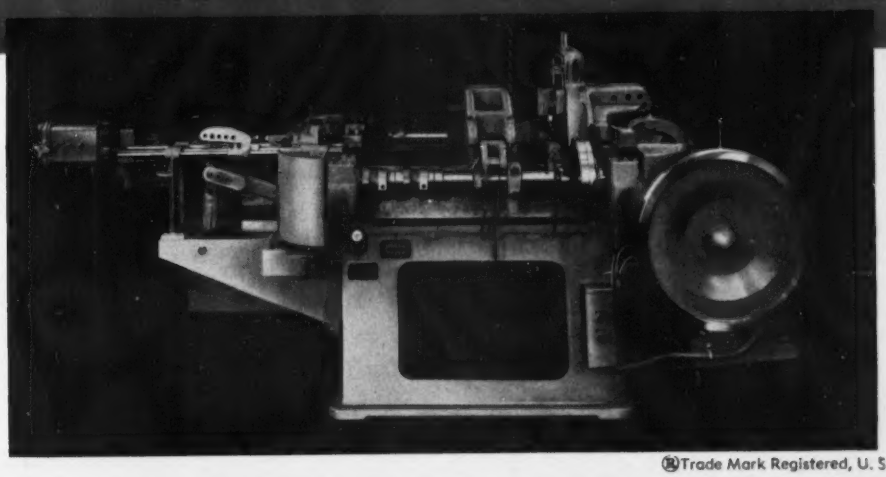
precision grinders

All
Produced
on U. S.
Multi-
Slides®!
PRODUCTS
U.S. TOOL

Secondary operations and handlings mean higher production costs. By producing parts complete in one operation you can — 1. Reduce labor costs. 2. Conserve floor space by eliminating secondary operation machines. 3. Increase production. 4. Simplify and reduce the number of necessary inspections and handlings. 5. Improve quality.

The parts illustrated are just a few of the many different types of precision formed metal stampings that can be produced complete in the U. S. Multi-Slide.® In the production of parts like these from coil stock, the U. S. Multi-Slide can effect substantial savings, because it completes a finished part at each stroke of the machine. Many different types of parts which would ordinarily require costly secondary operations can be profitably produced — uniformly and to close tolerances—and the number of inspections is also reduced.

U. S. Multi-Slides are built in four sizes. Illustrated is the No. 33, suitable for material up to 2½" in width, with feed length adjustable up to 12½". Complete specifications for the four sizes are contained in Bulletin No. 15-M. Ask for a copy.

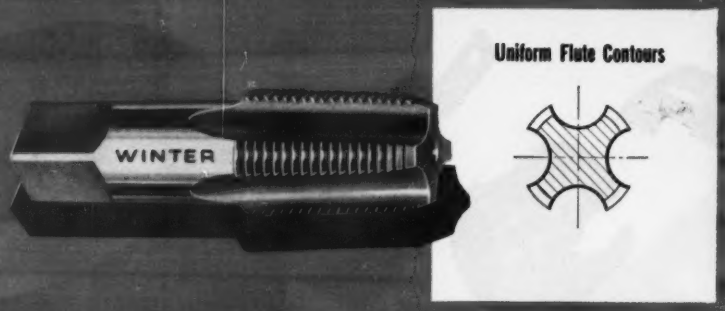


®Trade Mark Registered, U. S. Patent Office

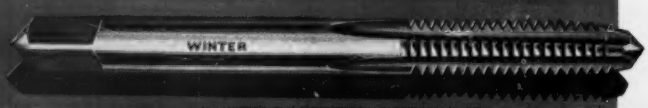
COMPANY, Inc.

AMPERE (East Orange)
NEW JERSEY

Builders of U S Multi-Slides—U S Multi-Millers
U S Automatic Press Room Equipment—U S Die Sets and Accessories

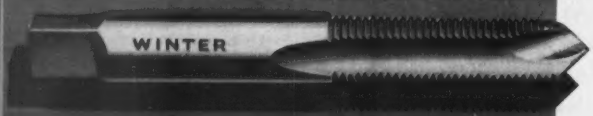


Uniform Flute Contours

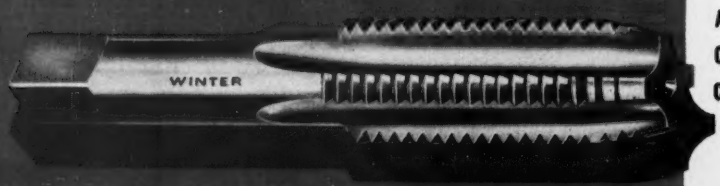


Exact Flute Spacing

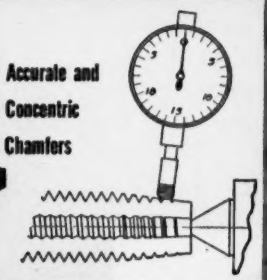
120°
120°
120°



Precision Chip Driver Contours



Accurate and Concentric Chamfers



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these carefully-manufactured Taps with

BALANCED Action

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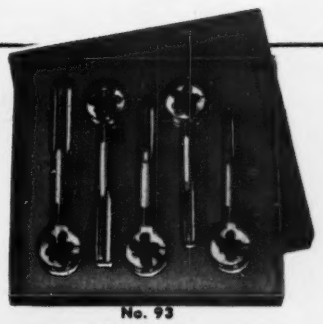
Warehouses in New York, Chicago, Detroit, Houston, San Francisco



No. 93
CONVERSION TAP AND DIE SET

No. 100
MASTER TAP AND DIE SET

No. 101
MASTER TAP AND DIE SET

No. 31
MACHINE SCREW TAP & DIE SET

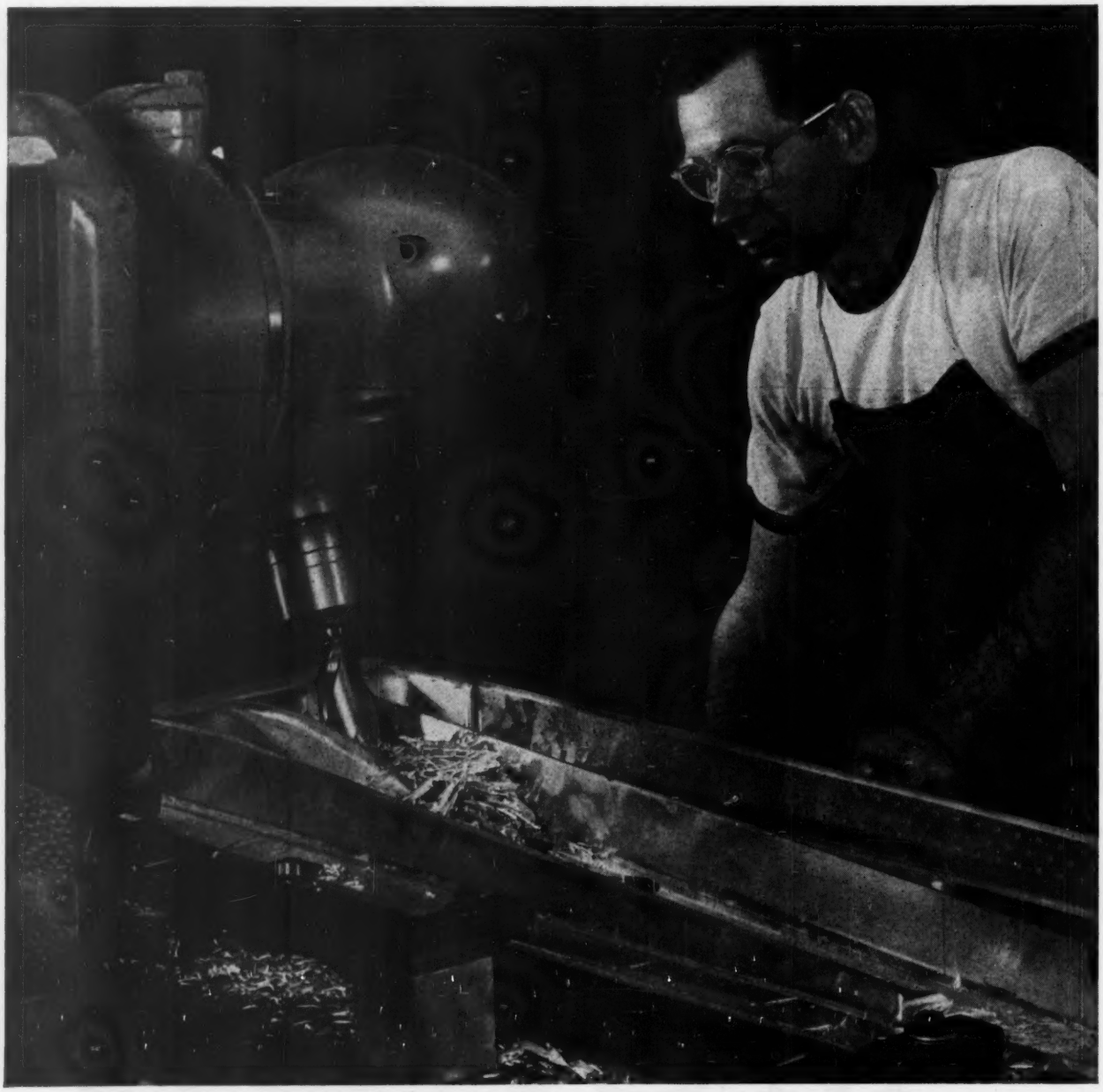
No. 200
HEXAGON
RETHREADING DIE SET

MORSE
Cutting Tools

Buy them by phone from your Morse-Franchised Distributor and save ordering time

KEARNEY & TRECKER MILWAUKEE

CK MILLING MACHINE OF STANDARD



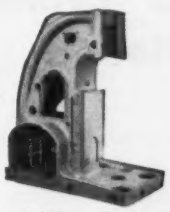
THE FACTS ON THIS JOB ARE: Machine: No. 6 — Model CK Plain (25hp) with heavy-duty universal Milling Attachment. Part: Large fusilage spar fitting — overall dimensions 39 3/16" x 17 3/8". Material: Aluminum Alloy 75ST (forging). Tool: 2-inch, 2-lip end-mill. (HSS). Speed: 265 rpm. Feed: 3 1/8 ipm.

Here's a typical example of how relatively inexpensive tooling greatly increases the versatility of Kearney & Trecker's new CK milling machines . . . producing a completed part every 6 minutes. Two operations were required for each part — (one) milling out the holes and recessing on the edges, then after changing the attachment setting and cutter — (two) finishing the inside (see photo).

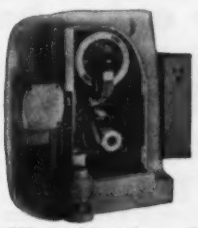
SPEEDS OUTPUT PRODUCTION PARTS

TEN ALUMINUM ALLOY 75ST (FORGING) AIRCRAFT SPARS PRODUCED EVERY HOUR FOR MAR VISTA ENGINEERING CO.

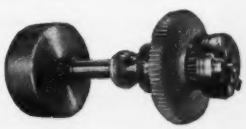
CK MILLING MACHINE FEATURES THAT HELP DO THIS JOB BETTER



Greater rigidity of new CK column easily absorbs vibration from heaviest cutting loads. Only single pass needed for each part.

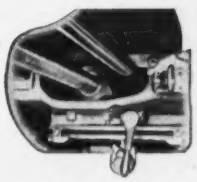


New CK machines have Greater Horsepower. On this job, 25 hp permitted operator to get maximum work from his modern cutter.

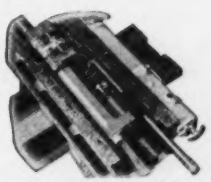


CK's 3-bearing spindle and flywheel assured Maximum Cutter Efficiency. On this job, it meant fast metal removal and excellent finish in a single pass.

The new Kearney & Trecker CK milling machine on this job has 24 different spindle speeds (13 to 1300 rpm). Its 32 different table feeds range from ¾" to 90" per minute. Operator was able to pick proper *speed and feed* — to take full advantage of high horsepower and modern tools. The result — Greater Productivity on this job.

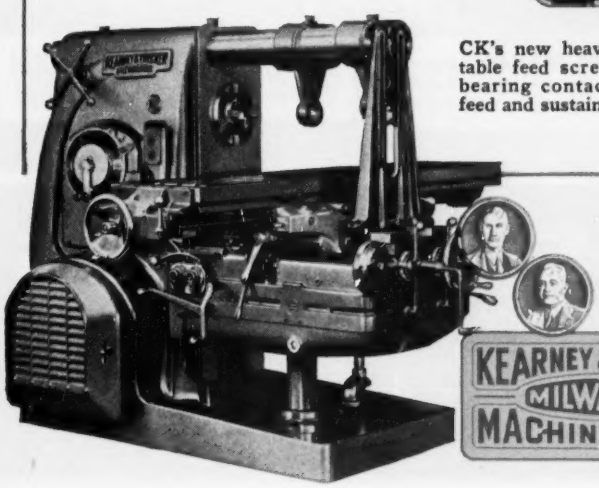


CK's new heavy duty (2" dia.) table feed screw gives greater bearing contact for smoother feed and sustained accuracy.



CK's positive lubrication plus generously proportioned gears and shafts assure cool, trouble-free operation under heaviest loads.

New 25hp No. 6 Model CK Plain



IT will pay you to see the new CK line of milling machines — check them against your own requirements. You'll notice how every feature is designed and job-proven to give you cost-cutting results — greater capacity, productivity and better finished products. For the full story, contact your nearest Kearney & Trecker representative or write: Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

HYPRO features that lower unit costs—*broaden work range!*

G&L Double Housing Planers for extra-heavy and carbide tooling applications

These advanced features make G&L Double-Housing Planers the most modern development of their type for precision machining available anywhere.

Modern HYPRO planer construction shown here simplifies the most complex setups. It assures greater machine rigidity, accuracy and speed for extra-heavy applications and use of alloy and carbide tooling. Table widths — 36" to 120" allow full range of operations on both "normal" and massive size castings or weldments. Maximum feeds and speeds may be used regardless of amount of metal to be removed for rough and finish machining. Logical arrangement of all components, safety and operating controls assures smooth, convenient operation.

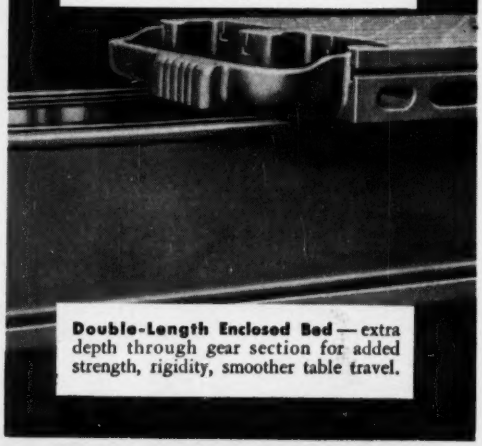
HYPRO planers have versatility to meet unusual production demands. To speed up overall operations, castings can be mounted in tandem. In this type of operation two rail heads and two side heads can be combined for multiple roughing cuts. This tandem arrangement saves tool set-up time . . . also insures precision alignment of bearing ways and accurate planing of all flat surfaces. This arrangement provides identical interchangeable work pieces.

Whether your work is simple or complex . . . large or small let these modern G&L HYPRO features work for you. Best way to find out how you can improve planing efficiency is to contact your nearest G&L representative. He'll tell you all about G&L's unbiased Job Analysis. Remember, there's no obligation . . . and DELIVERY ON G&L MACHINES MIGHT BE BETTER THAN YOU THINK!

Logical Grouping of Electrical and Safety Devices — assures most complete protection of machine and operator.

New HYPRO Pneumatic Tool Lifters — prolong tool life. Advanced cam and snubber design assure shockless tool block reseating without disturbing tool settings.

Patented Automatic Hydraulic Table Stop — protects against gear damage. Acts with a uniform decelerating motion without shock to planer in event of electrical or control failure. Eliminates "extras" — rack sections, cranes, etc.



Double-Length Enclosed Bed — extra depth through gear section for added strength, rigidity, smoother table travel.

GIDDINGS & LEWIS

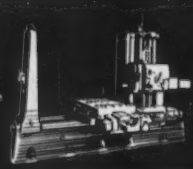
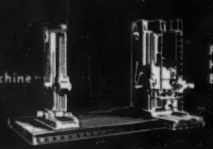
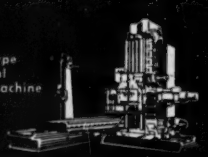


Table Type Horizontal Boring Machine

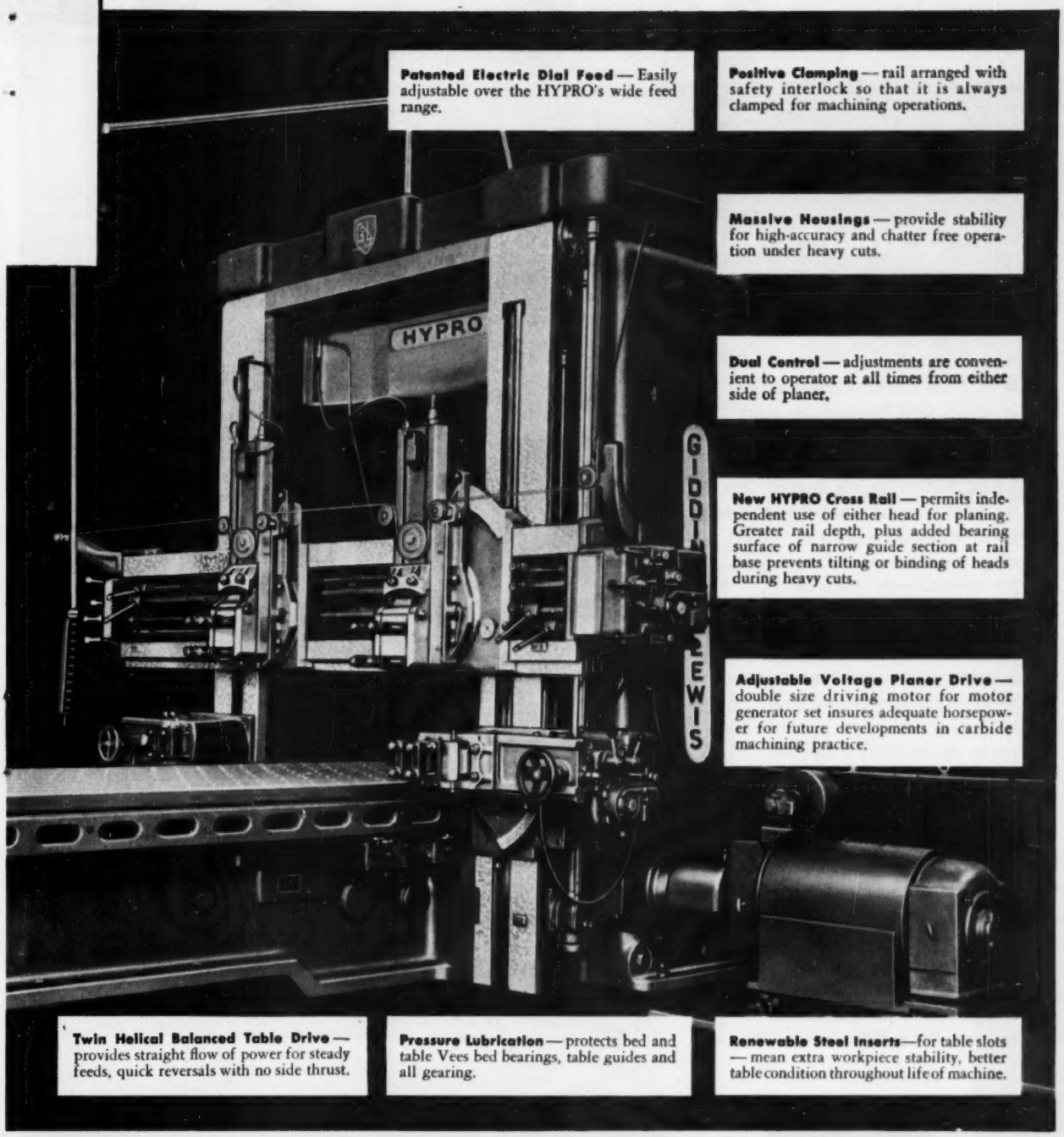


Floor Type Horizontal Boring Machine



Planer Type Horizontal Boring Machine

Hypro Open-Side Planer



Patented Electric Dial Feed — Easily adjustable over the HYPRO's wide feed range.

Positive Clamping — rail arranged with safety interlock so that it is always clamped for machining operations.

Massive Housings — provide stability for high-accuracy and chatter free operation under heavy cuts.

Dual Control — adjustments are convenient to operator at all times from either side of planer.

New HYPRO Cross Rail — permits independent use of either head for planing. Greater rail depth, plus added bearing surface of narrow guide section at rail base prevents tilting or binding of heads during heavy cuts.

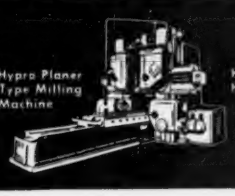
Adjustable Voltage Planer Drive — double size driving motor for motor generator set insures adequate horsepower for future developments in carbide machining practice.

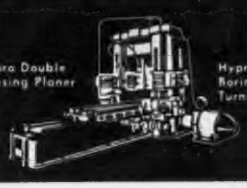
Twin Helical Balanced Table Drive — provides straight flow of power for steady feeds, quick reversals with no side thrust.

Pressure Lubrication — protects bed and table Vees bed bearings, table guides and all gearing.

Renewable Steel Inserts — for table slots — mean extra workpiece stability, better table condition throughout life of machine.

MACHINE TOOL CO.


Hypro Planer Type Milling Machine


Hypro Double Housing Planer

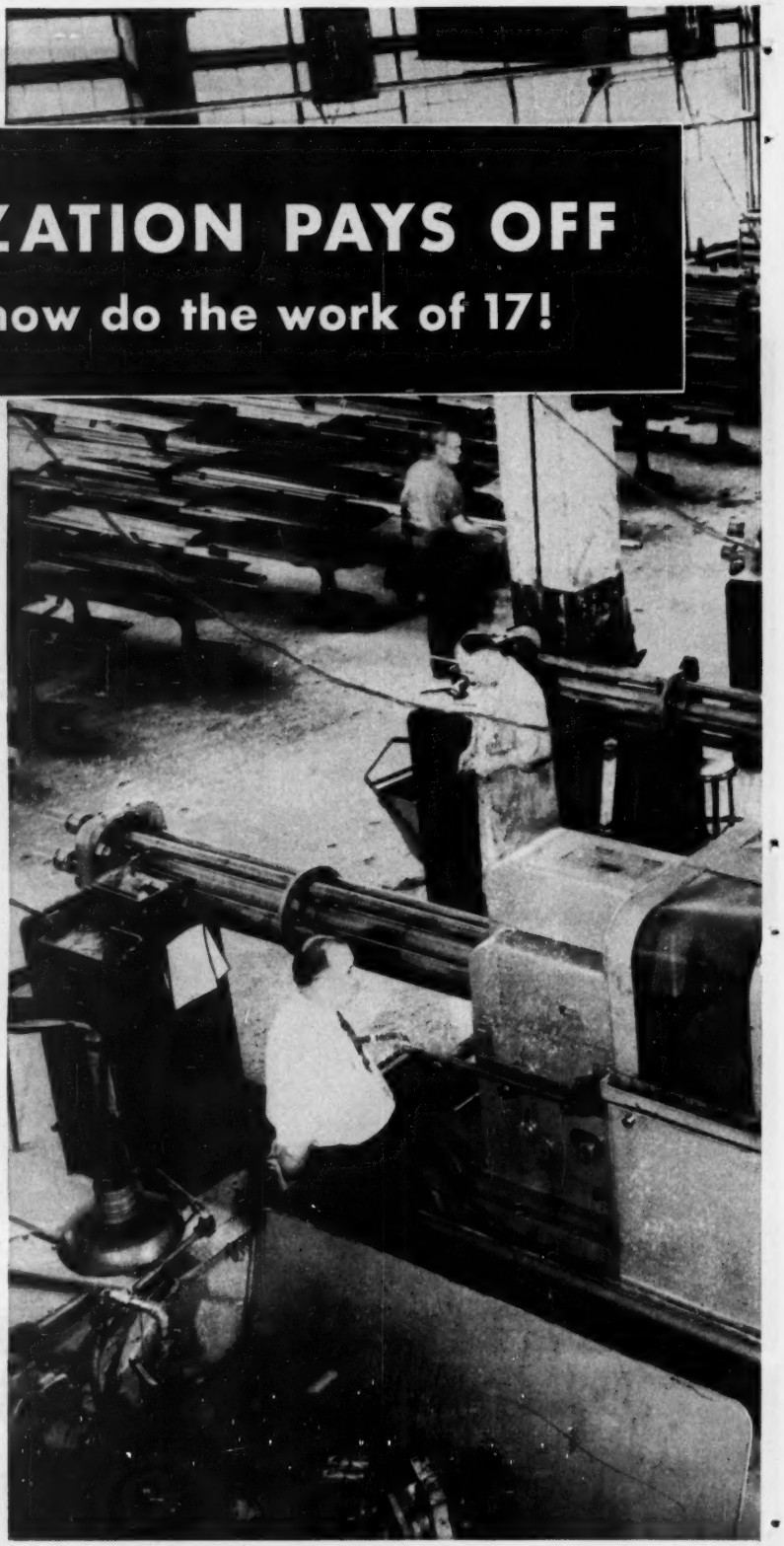
Hypro Vertical Boring and Turning Mill

G&L HYPRO

FOND DU LAC
WISCONSIN

MODERNIZATION PAYS OFF

6 machines now do the work of 17!



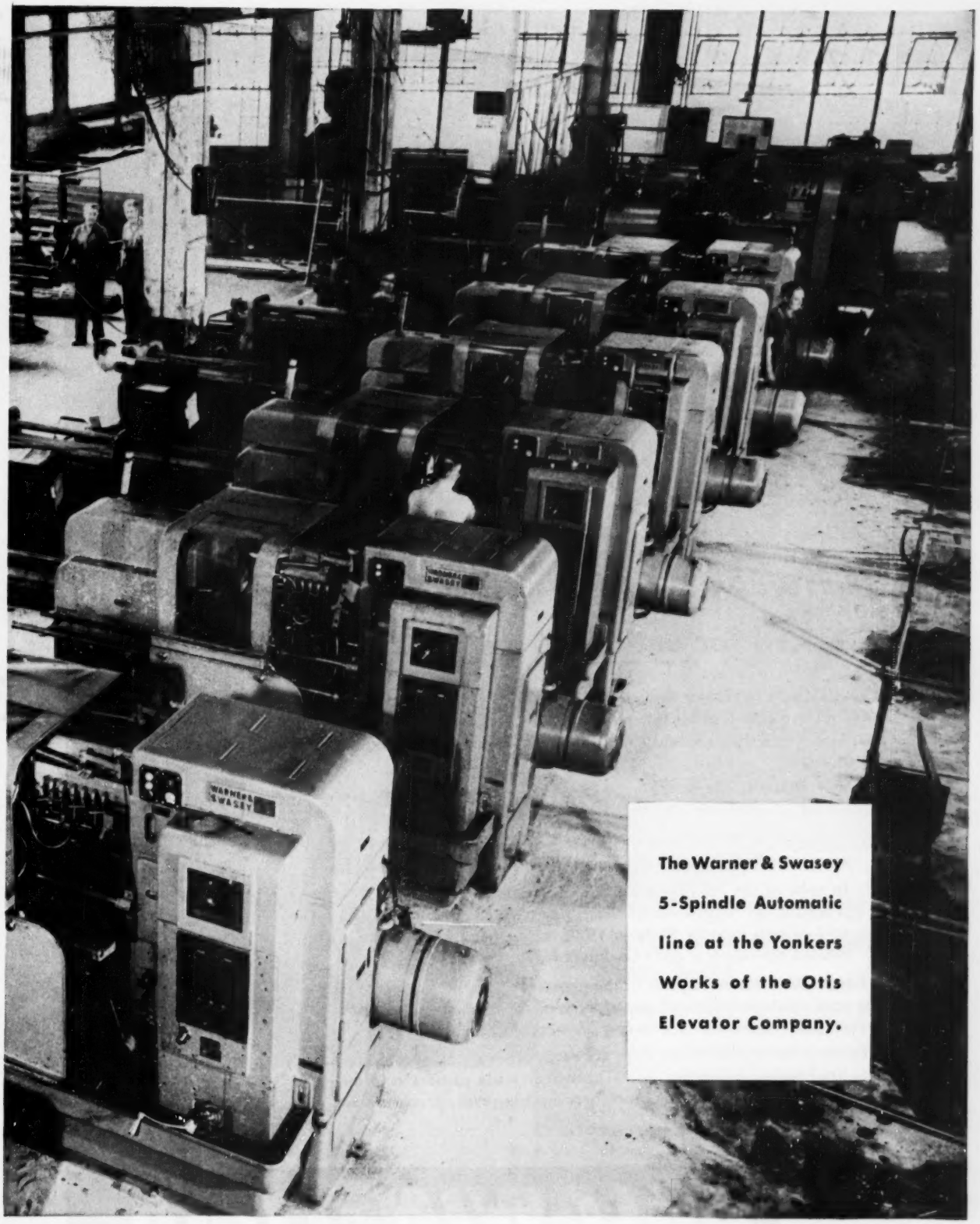
• As part of their modernization program, Otis Elevator Company replaced 17 machines with 6 Warner & Swasey 5-spindle Automatics. These automatics are used at Otis for short runs on specially-machined parts—studs, bolts, nuts and other screw machine products—required for custom-made elevators.

The results of this modernization program: increased production in less floor space, more uniform parts, and six critically needed men released for work elsewhere in the plant. At Otis only 3 men are required to set up and operate these 6 automatics.

Because of its quick setup and ease of operation, the Warner & Swasey 5-spindle Automatic makes automatic production economical on short runs as well as large lots. It's a machine designed to meet the requirements for lasting accuracy and increased production for the years ahead.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY



The Warner & Swasey 5-Spindle Automatic line at the Yonkers Works of the Otis Elevator Company.

"advanced control and speed range concepts which anticipate the future"

... was what ALLIS-CHALMERS asked for *and got* from NILES

Allis-Chalmers engineers wanted something special in machine tools. They wanted a 30-foot boring mill with "advanced control and speed range concepts which would anticipate the future . . . remain modern for decades."

Today, that Niles-built boring mill is hard at work in Milwaukee. A success? . . . just read what Allis-Chalmers has to say:

> "Niles Tool Works translated Allis-Chalmers' desires into a machine which has *fully met its high expectations.*
>
> In spite of the machine's vastly more complicated design, it is felt that its ruggedness and reliability will equal that of the 40-foot mill built by Niles in 1928, which has been in continuous operation at Allis-Chalmers for 23 years."

Results like this are typical of the experience of Niles users. So, if you need machine tools *with special features . . . with unusual versatility, strength and ruggedness . . . with long life*—come to Niles.

In the Niles standard line there are vertical boring mills to 43-feet, side-head mills to 54-inches, 6-inch horizontal mills, planers to 15-feet, lathes to 120-inches. Each is a brute force machine *with a precision touch.*

BALDWIN-LIMA

BALDWIN
BLH
LIMA-HAMILTON

-HAMILTON

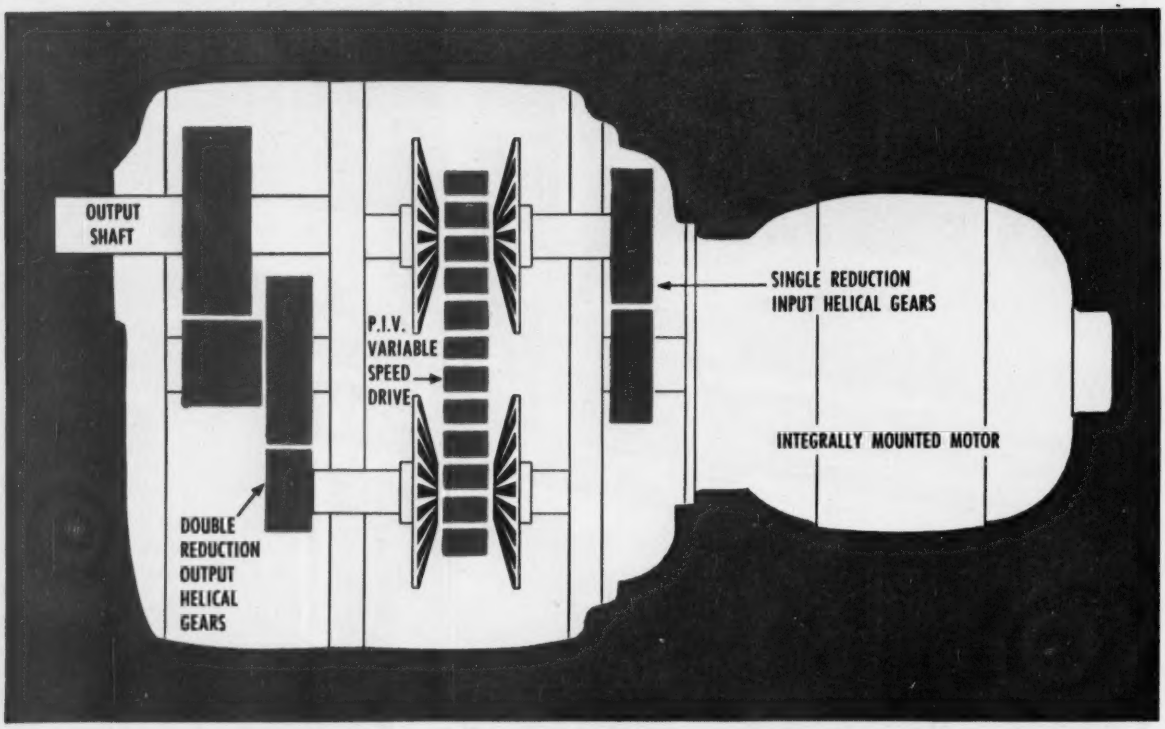
HAMILTON DIVISION • HAMILTON, OHIO

It's one of the MOST VERSATILE machines ever built! . . . . . .

- Electrical control of all movements except where hand setting is desired.
- 45-degree motor-operated swivel of boring bars
- Four station electrical control
- Detachable milling head
- Automatic warning of incorrect lubrication, etc.
- Maximum swing—30-feet, 5-inches
- Max. height under tool—17-feet
- Bar travel—10-feet

Write for the technical paper describing this Niles 30-foot boring mill and other large Niles mills including the 43-foot mill.

Here's a complete package...



--motorized variable speed drive PLUS speed reducer

Whether your variable speed problem is simple or complex, Link-Belt's P.I.V. can increase the flexibility and efficiency of your machines. For this variable speed drive is not dependent on friction—you get exact speed selection in *positive*, infinitely variable settings.

Shown here is the Model HMDG. Both input and output helical gears and the variable speed drive are lubricated from a common reservoir. This is just one of dozens of P.I.V. drives Link-Belt power transmission engineers can choose from to match your exact requirements. Available in 8 types—vertical or horizontal—with or without extra reduction gears—with or without motors.

LINK-BELT
P.I.V. VARIABLE SPEED DRIVE

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices in Principal Cities. 12,841

ALL INDUSTRY USES P.I.V.*
*Positive, infinitely variable

You can get instant speed changes and maintain them accurately while operating under full load.

An infinite number of positive, stepless speed adjustments may be made with manual, electric, pneumatic or hydraulic controls.

Easy-view speed indicator facilitates speed selection and adjustments to meet all requirements.

All-metal, totally enclosed — unaffected by atmospheric conditions. All vital operating parts splash-lubricated from a common housing reservoir.

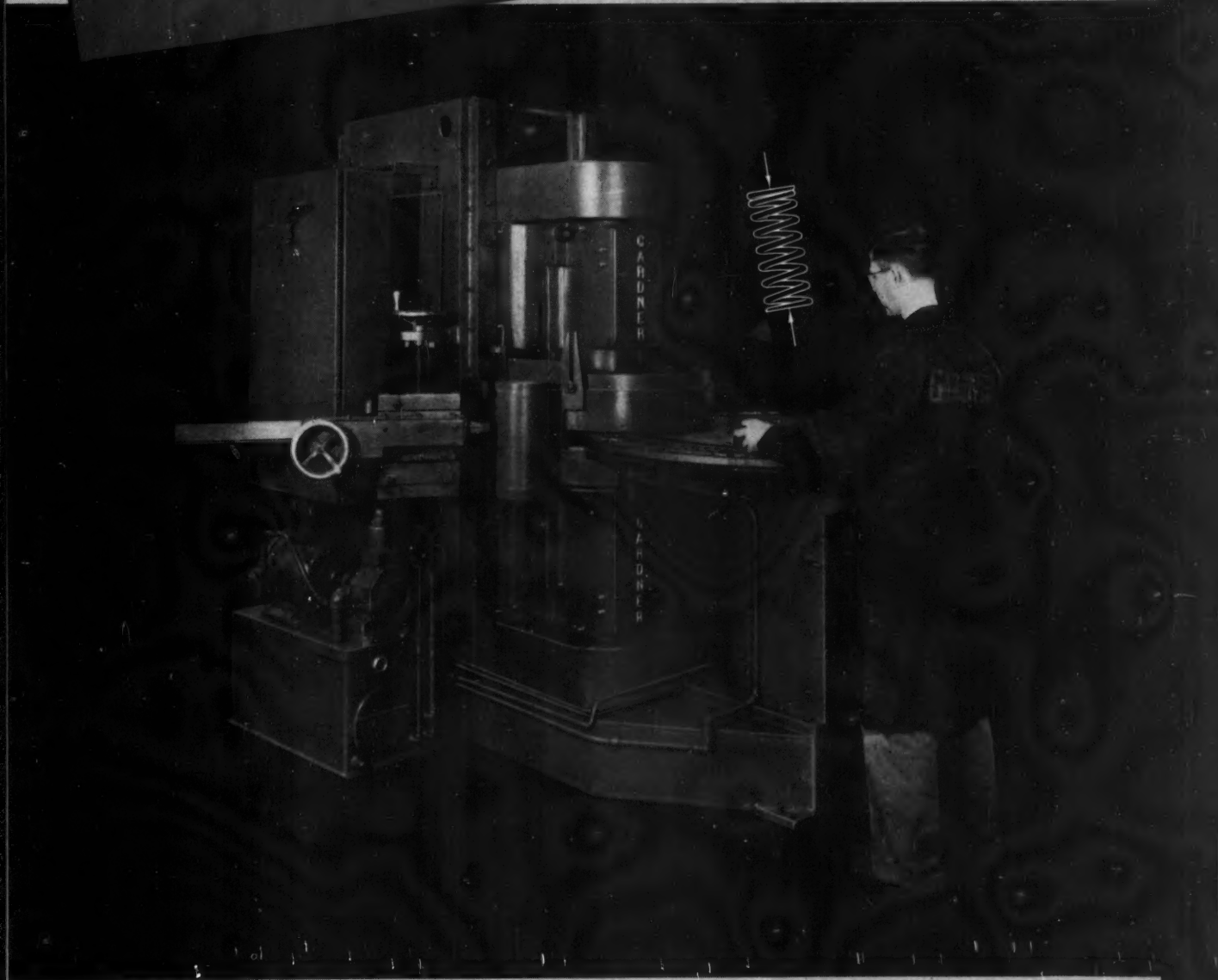
Self-tooth-forming chain grips toothed wheels positively without slippage — gives the speed you need at any setting.

GARDNER Grinders

precision disc

Grinds 2000 Coil Springs Per Hour

TWO parallel surfaces ground in ONE operation



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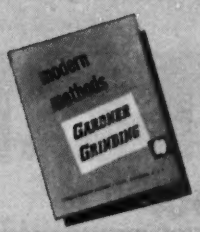


Write for new catalog

WORK DATA

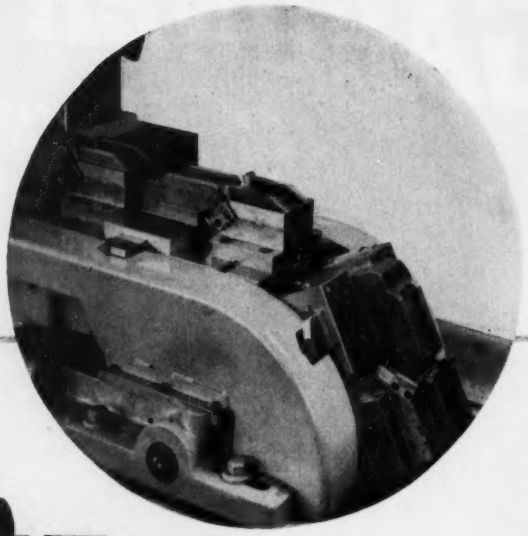
MACHINE	Gardner No. 211 Vertical Double Spindle Grinder
PART	Coil Springs .715″ O.D. x .750″ long
MATERIAL	3/16″ wire
STOCK REMOVAL	Approx. .300″ over all
TOLERANCES	1/2° to 1° for squareness; .004″ for uniformity
PRODUCTION	2000 per hour

GARDNER MACHINE COMPANY

414 East Gardner Street · Beloit, Wisconsin, U. S. A.

LOWER COST PER PIECE

with continuous surface broaching of small parts



● Holding fixtures are designed for quick, convenient loading, with automatic clamping and unclamping.

● In many plants where large quantities of duplicate metal parts are being machined substantial savings are being made through the adoption of surface broaching. Production is exceptionally high, close tolerances are maintained, and tool maintenance costs are much lower than with ordinary methods. Foote-Burt engineers, pioneers in this advanced machining method, have had a wide experience in applying surface broaching in many fields.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio

Detroit Office: General Motors Building

FOOTBURT

machine tools

Pointing The Way To Lower Costs

Plant after plant, in every compass direction, has found that Cimcool° is a short and easy route to lower costs. And this revolutionary cutting fluid—this *chemical emulsion*—does a *better job*, while saving money three important ways:

CIMCOOL INCREASES TOOL LIFE (and thus reduces down time) because of its chemical lubricity.

FASTER SPEEDS are possible because Cimcool cools faster, through a unique physical change in the cutting fluid itself. Tools and chips actually stay cool to the touch.

CIMCOOL COSTS LESS than old-fashioned cutting fluids because it lasts longer. It also cuts labor costs for cleaning and changing. It virtually eliminates rancidity and foul odors. And because of its low surface tension and low adhesion to work and chips, there is practically no carry off.

For a demonstration, write us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet "CIMCOOL Defeats Heat." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

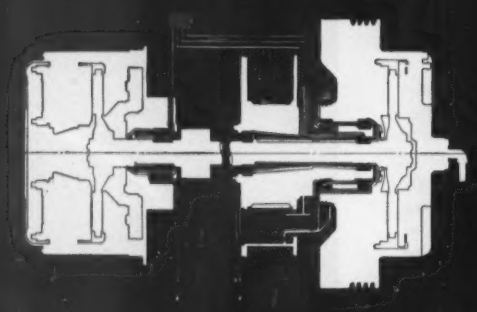
°Trade Mark Reg. U.S. Pat. Off.

when you buy presses...
take a close look at lubrication

Automatic oil lubrication saves hundreds of hours of press maintenance, decreases the hazard of damage due to lubrication failure or neglect and greatly reduces press down time. Your press is protected!

This Danly feature—and others like the exclusive Danly Cool-Running Clutch and extra rigid construction—explains why new plants and new production lines throughout industry are being equipped with . . .

DANLY PRESSES



Danly's complete engineering staff is at your service to help you select the best presses for your job. Write today—and ask for the Danly Straight Side Press Catalog.

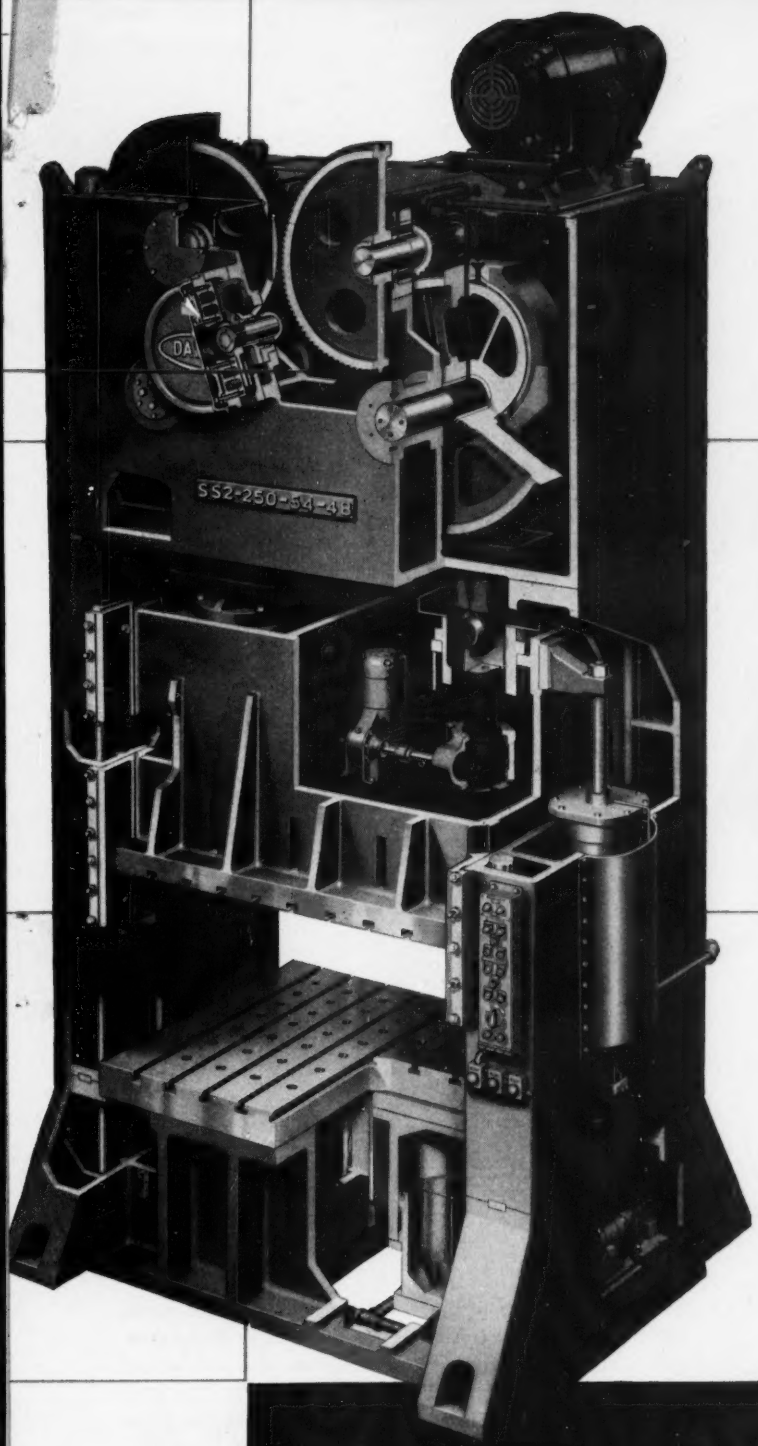
DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue, Chicago 50, Illinois

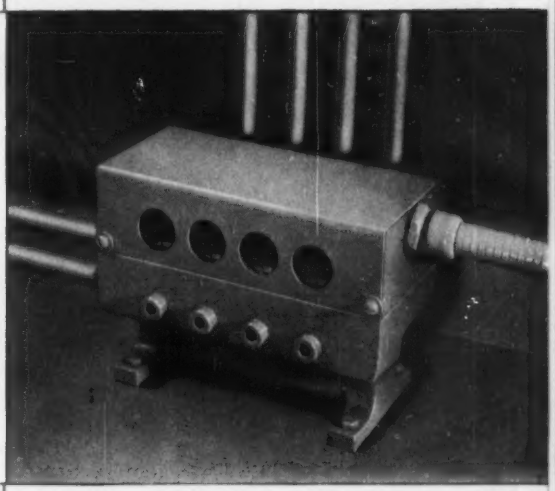
It costs less to run a DANLY PRESS!

Single Action Straight Side | Autofeed | Underdrive Single, Double Triple Action | Gap Frame | Double Action Straight Side

POSITIVE OIL LUBRICATION—ELECTRICALLY CONTROLLED

Diagram at left indicates important drive shaft bearing lubrication system. Oil, shown in color, is piped under pressure to the bearings—all anti-friction type. Any drop in oil pressure below normal operating levels in this completely automatic system stops the press—positive protection against damage due to lack of lubrication.





AUTOMATIC GUARDIAN OF PRESS LUBRICATION

Close-up view of special Danly oil pressure safety switch. This switch completes the Danly lubrication protection system by stopping the press immediately in the event of oil stoppage in any line—and indicates the faulty line!

CONTINUOUS AUTOMATIC OIL LUBRICATION INCLUDES GIBS

Cutaway at left shows how Danly Presses provide complete automatic lubrication (in color) to the drive mechanism and slide—including gibs.

- *Maintenance is reduced by preventing needless breakdowns arising from irregular or insufficient lubrication.*
- *Oil supplied continuously under pressure to gibs permits extremely close slide adjustment—prolonging die life.*

DANLY®

MECHANICAL PRESSES . . . 50 TO 3000 TONS
HYDRAULIC METALWORKING EQUIPMENT

Finer Than a Watchmaker's Masterpiece!

This operation is typical of the laboratory-like techniques used in New Departure plants. The highly skilled operator is wearing special kid gloves to avoid contaminating the ball bearing.

New Departure ball bearings are quickly available at your equipment dealer or bearing distributor—supplied from the industry's largest nation-wide network of warehouse stocks.

The finest products of the watchmaker's art do not reach the high level of precision attained by New Departure ball bearings. Manufacturing standards which insist on many tolerances being held to millionths of an inch give these bearings the ability to provide the virtually friction-free support demanded by moving parts of machines.

In the metal working industry, New Departure "Sealed-for-Life" ball bearings make possible better design of machine tools. N-D-Seals eliminate the need of fixtures and lines for bearing lubrication . . . in many instances requiring less housing space and fewer parts.

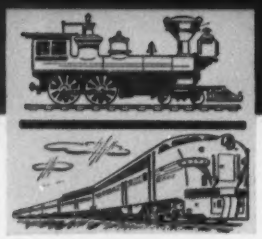
Research, engineering and production at New Departure are focused on one major objective . . . making the *best* ball bearings for every kind of application. Keep your eye on the BALL to be sure of your BEARINGS!

NOTHING ROLLS LIKE A BALL

NEW DEPARTURE
BALL BEARINGS

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONNECTICUT
Also Makers of the Famous New Departure Coaster Brake

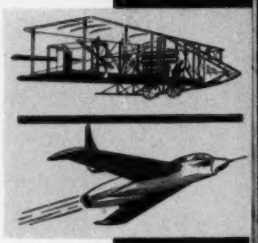
No turret
cams to change
on New Britain's new
Single Spindle
Automatic.



super-high spindle speeds essential for brass and aluminum. A cross slide in each position. Actuated by disc-type cams directly behind the slide. Exclusive features permit quick setups where short runs are the rule.

New Britain Precision Boring Machines include models for both straight or contour boring and turning. They are simple in design, and their cam controlled slides enable them to positively repeat from piece to piece, holding size to within .0001, with spindle speeds up to 7300 r.p.m. High production and great versatility are assured by such features as two-speed drive, rapid traverse, optional automatic loading device and optional vertical cross slide. Additional spindles may be mounted if the type and size of the job permits it. A double-end model is also available.

New Britain Model 126, a completely new approach to single spindle metal turning. Simple cross slide cams which can be preset have been specifically designed to reduce down time. Feed and speed changes automatically controlled from program drum. The Model 126 can be readily and quickly set up by the operator, and is adaptable to a variety of work jobs involving either long or short runs.

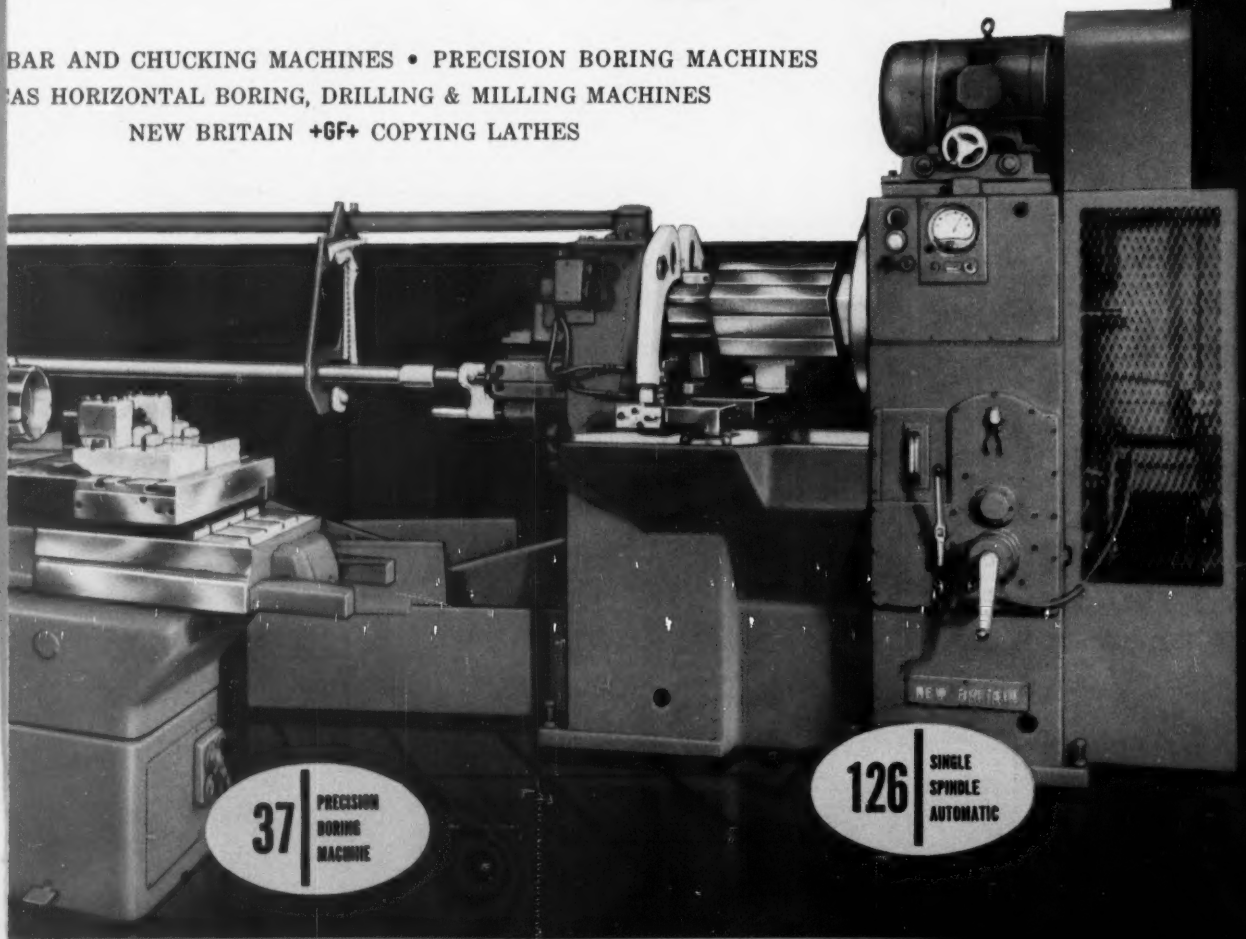


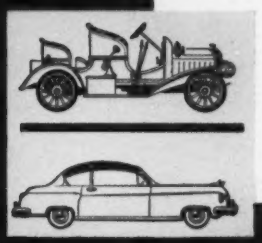
THE NEW BRITAIN MACHINE COMPANY

New Britain-Gridley Machine Division
New Britain, Connecticut

Lucas Machine Division
Cleveland 8, Ohio

BAR AND CHUCKING MACHINES • PRECISION BORING MACHINES
AS HORIZONTAL BORING, DRILLING & MILLING MACHINES
NEW BRITAIN +GF+ COPYING LATHES





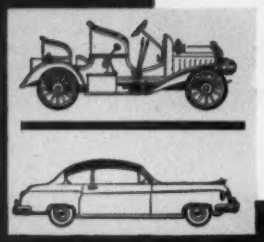
Machines for Making Progress

TODAY'S improvements in transportation make front page news. Behind every such advance is a similar improvement in the machines that turn out the products which go into each plane or train or motor car. Without better machines, progress would slow down to a walk.

On this page are three ultra modern machines vital to the plants where manufacturing history is being made. Are your machines this modern? If not, can you afford to do without the production speed and economy they make possible?

Model 601 Multiple Spindle Automatic Screw Machine is the most advanced tool for multiple operations on bar stock up to 1¼". This six-spindle machine is massive and powered for tough forming steel jobs. Designed for

AUTOMATIC
LUC



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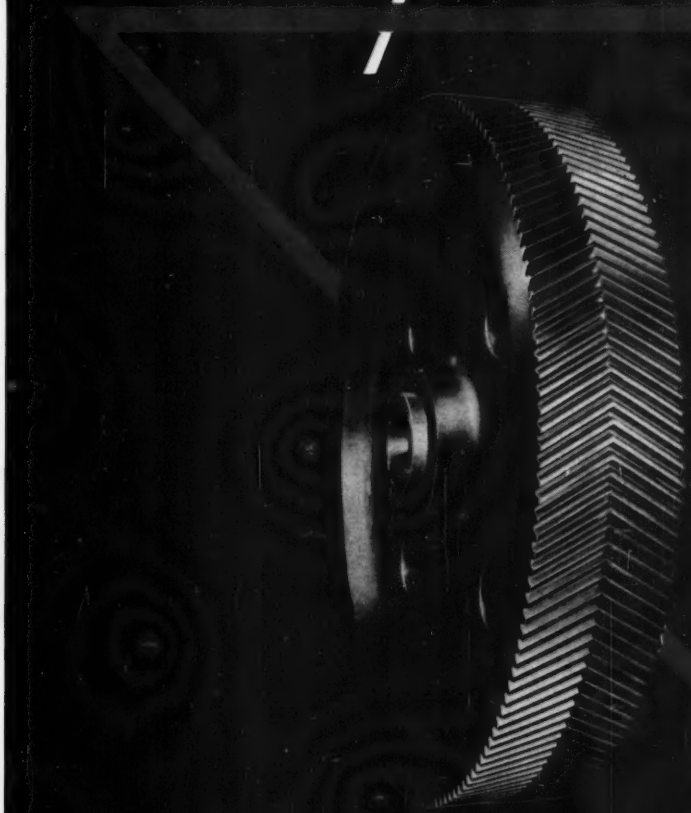
Enough said...



...it's a PHILLIE GEAR

OVER 60 YEARS IN ONE LINE OF BUSINESS

Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

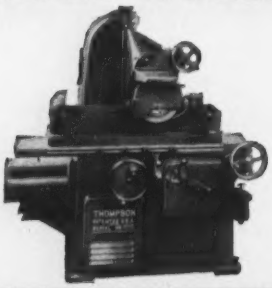
NEW YORK · PITTSBURGH · CHICAGO · HOUSTON · LYNCHBURG, VA.

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

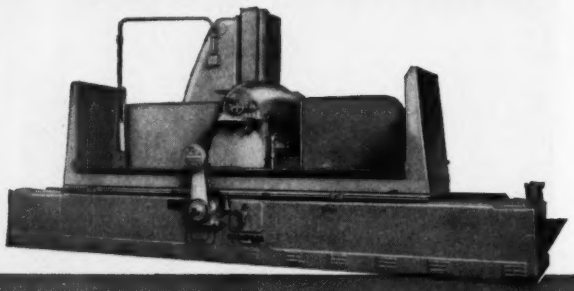
Save Time and Money ... Select

THOMPSON

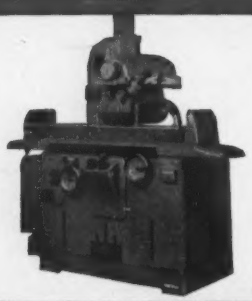
HYDRAULIC SURFACE AND CONTOUR GRINDERS



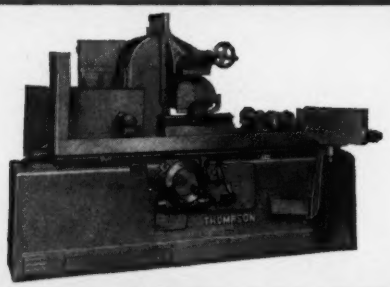
TYPE B Small General Purpose Grinders sizes from 6x18x18 to 12x18x120



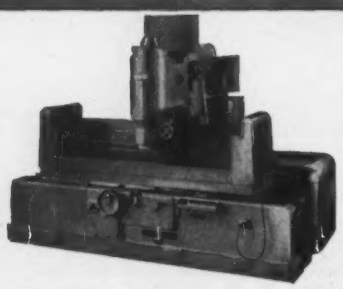
TYPE C & CX Medium and Heavy Duty Grinders sizes from 16x16x48 to 24x36x360



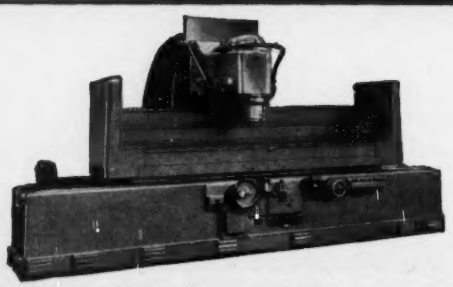
TYPE F Tool Room Grinders available in sizes 6x10x18 and 8x10x24



TYPE B & C TRUFORM Contour Grinders for all shapes sizes 10x12x30 to 14x14x54



FIXED COLUMN VERTICAL SPINDLE Production Surface Grinders sizes 12x18x36 to 20x36x120



SLIDING COLUMN VERTICAL HYDROVERT For contouring or small-level surfacing sizes 16x24x48 to 48x96x192

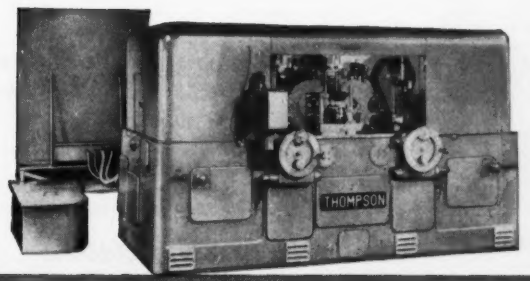
Write Thompson today for details . . .

1 **WIDEST RANGE** of light and heavy duty Surface and Contour Grinders

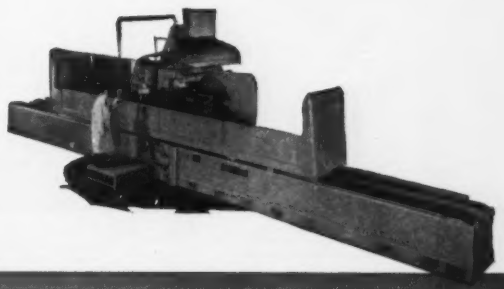
2 **HIGHEST ACCURACY** for lower costs

3 **PROVED QUALITY** for longer service

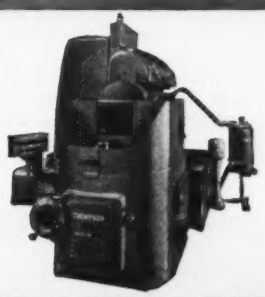
4 **SPECIAL MACHINES** for any surface and contour grinding application



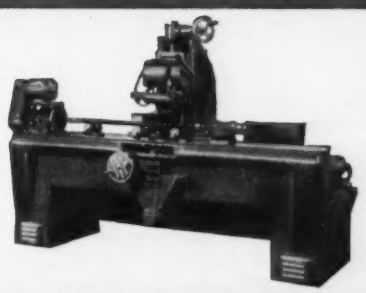
DOUBLE WHEEL BUCKET AND BLADE GRINDER for jet aircraft



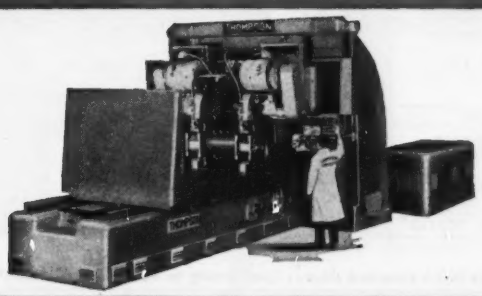
WAY GRINDERS Many sizes and types from 12in x 11in x 48 to 56in x 56in x 240



TWIN CHUCK ROTARY GRINDER For grinding circular metal discs 6 to 18 inch and 6 to 16 inch sizes



NEW SERIES 600 MANUAL BROACH GRINDER sizes 4in x 6in to 6in x 24in



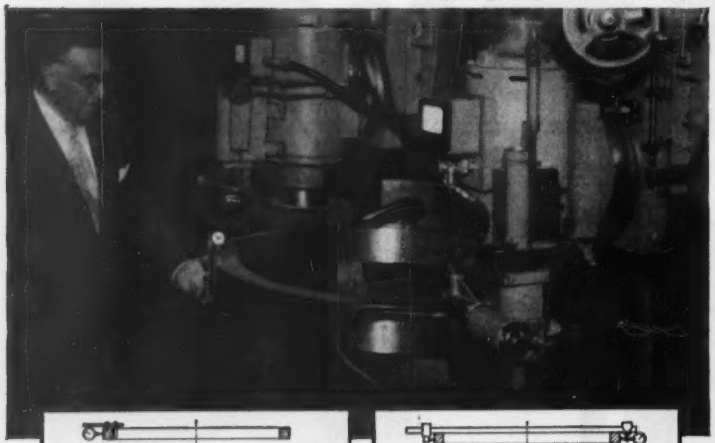
RAIL TYPE HYDRAIL Widest grinder ever built sizes 48in x 36in x 96 to 72in x 36in x 240

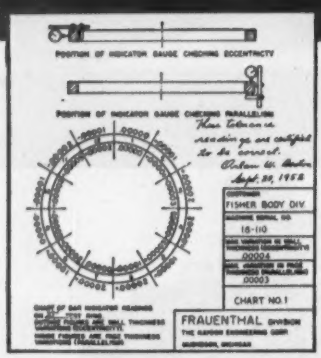
Thompson SURFACE Grinders

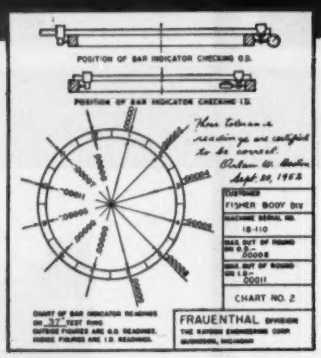
The Thompson Grinder Co., Springfield 1, Ohio

GRINDING TO millionths*

OF AN INCH







* *Our normal method of expressing tolerances in tenths-of-thousandths of an inch became inadequate when precision was attained to fractions of tenths-of-thousandths, expressed best in MILLIONTHS of an inch.*

Utmost precision proved by meticulous tests, and certified by Orlan W. Boston, Chairman, Department of Production Engineering, University of Michigan. He witnessed tests at Frauenthal plant in Muskegon and certified their validity on precision grinding of a 37-inch test ring, on Frauenthal Grinder No. 18-110 (shipped to Fisher Body Division for grinding tank bearings).

You get TOP PRECISION with Frauenthal Grinders

The certified readings listed at left are much closer than the 200-millionths of an inch precision specified for these machines. You can get similar results on other sizes of Frauenthal Multiple-Head Super-Precision Cylindrical Grinders, up to 140-inch diameter grinding on the Series 2200 machines. Uniformity of precision is assured in concentricity, parallelism and roundness. You can make many combination settings of grinding-spindle positions for a wide variety of simultaneous grindings of outside, inside and faces. Details on request.

PRECISION GAUGE READINGS • CHART NO. 1

MAX. VAR. IN FACE THICKNESS (Parallelism)				MAX. VAR. IN WALL THICKNESS (Eccentricity)			
Station	Reading	Station	Reading	Station	Reading	Station	Reading
1	.000000"	7	.000000"	1	.000000"	7	+.000020"
2	+.000010"	8	+.000020"	2	+.000010"	8	+000010"
3	+.000030"	9	+.000030"	3	+.000020"	9	.000000"
4	+.000030"	10	+.000030"	4	+.000020"	10	−.000010"
5	+.000030"	11	+.000030"	5	+.000010"	11	−.000020"
6	+.000010"	12	+.000020"	6	+000020"	12	−.000010"

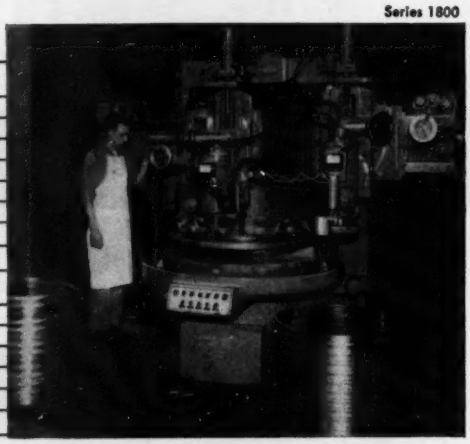
Maximum Variation in Parallelism: .000030" Maximum Variation in Eccentricity: .000040"

PRECISION GAUGE READINGS • CHART NO. 2

MAX. OUT-OF-ROUND ON O. D.				MAX. OUT-OF-ROUND ON I. D.			
Station	Reading	Station	Reading	Station	Reading	Station	Reading
1	.000000"	4	−.000050"	7	.000000"	10	−.000110"
2	−.000020"	5	−.000080"	8	.000000"	11	−.000070"
3	−.000040"	6	.000000"	9	−.000050"	12	.000000"

Maximum Variation, Outside Diam: .000080" Maximum Variation, Inside Diam: .000110"

Series 1800



What is YOUR Grinding Problem?

Through more than a decade of toolroom and production grinding, Frauenthal Grinders have been performance-proved on tough precision jobs, such as helicopters, jet engines, army and navy tanks and gunmounts, Diesel engines, machine tools, 120-inch diameter KAYDON precision bearings and similar products. We'll be glad to work with you on difficult grinding problems.

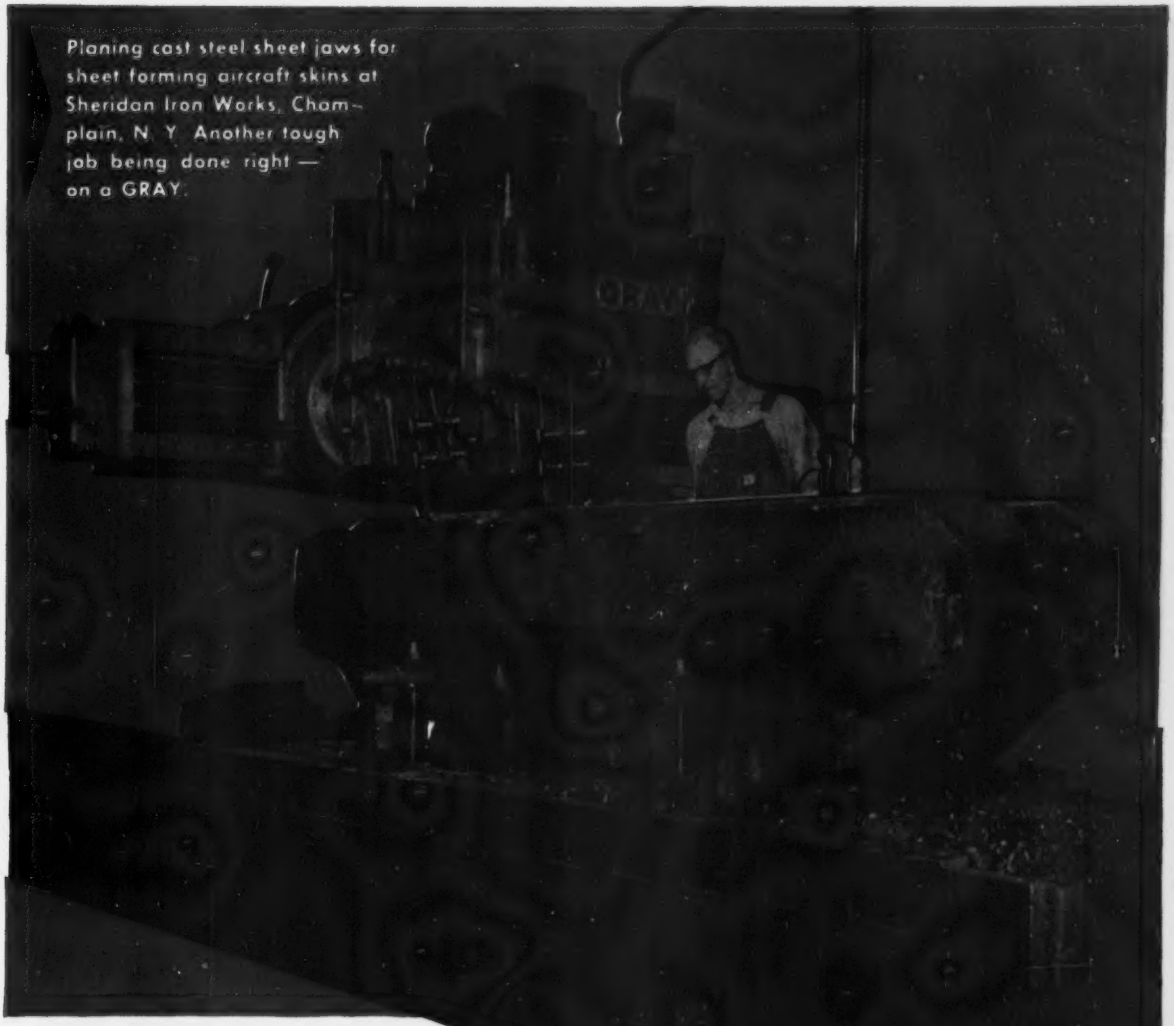
Made in 10 standard sizes . . . conforming to essential J.I.C. specifications

	Series 1800	Series 2000	Series 2200
Table sizes	30" 36" 42" 48"	60" 72"	110" 120" 130" 140"
Maximum Swing	56" 56" 56" 56"	72" 88"	120" 130" 140" 150"

Ask for Bulletin

Frauenthal Division THE KAYDON ENGINEERING CORP., MUSKEGON, MICH.

PRECISION-GRIND INSIDE, OUTSIDE AND FACES SIMULTANEOUSLY



Planing cast steel sheet jaws for sheet forming aircraft skins at Sheridan Iron Works, Champlain, N. Y. Another tough job being done right — on a GRAY.

400% .. production increases can be obtained through carbide planing with a GRAY heavy duty OPENSIDE PLANER

. . . reports the Sheridan Iron Works, Champlain, N. Y. where a line of GRAY openside planers are delivering high production at low cost.

Everywhere, the odds are constantly increasing in favor of the GRAY. Its astonishing rigidity permits heavy hogging with precision finish cuts.

Its openside design means "plus" value capacity, greater versatility. Get the benefits of substantial savings in time and money with a GRAY heavy duty openside planer.

Write today. Get the story on GRAY

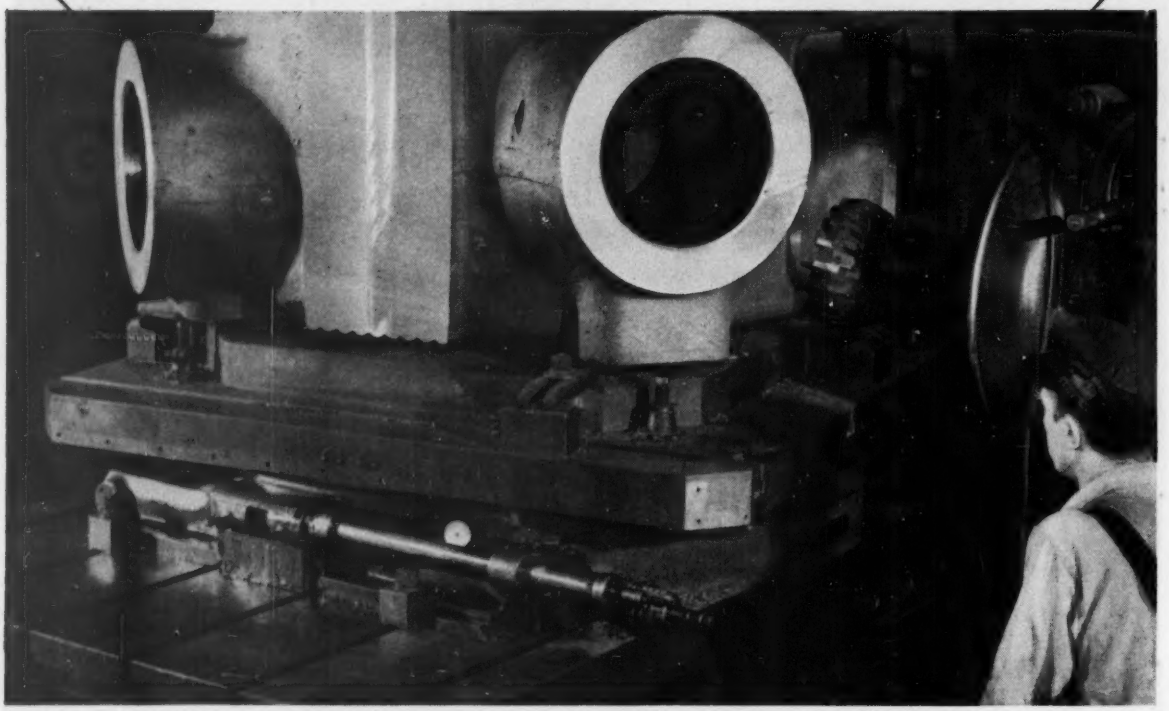
HIGH
low cost
PRODUCTION

The G.A. GRAY Company

planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.
SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

How to beat multiple setups and cut unit costs too!



Giddings & Lewis Rotary Tables increase machine flexibility and working range on Horizontal Boring Mills

G&L Rotary Tables turn set-up time into profit time, perform many complex machining operations in a *fraction of the time* it takes on conventional tables. You can rotate and rapidly index work in horizontal, vertical or tilted positions without usual delays.

Illustration shows combination plain and hand feed Rotary Table that may be turned rapidly by hand to approximate position. Fine adjustments are made with hand crank. Other round or square sizes are available up to and including the 60" x 96" rectangular platens. Close-limit machining is made possible by table graduations to ½°, handy indexing stops, and dial indicator, accurate to .001".

For all the information on G&L Rotary Tables for all types of horizontal boring, drilling and milling machines — write direct or contact your nearest G&L Distributor for bulletin A-20.

Available in Plain, Hand and Combination Power Feed Models

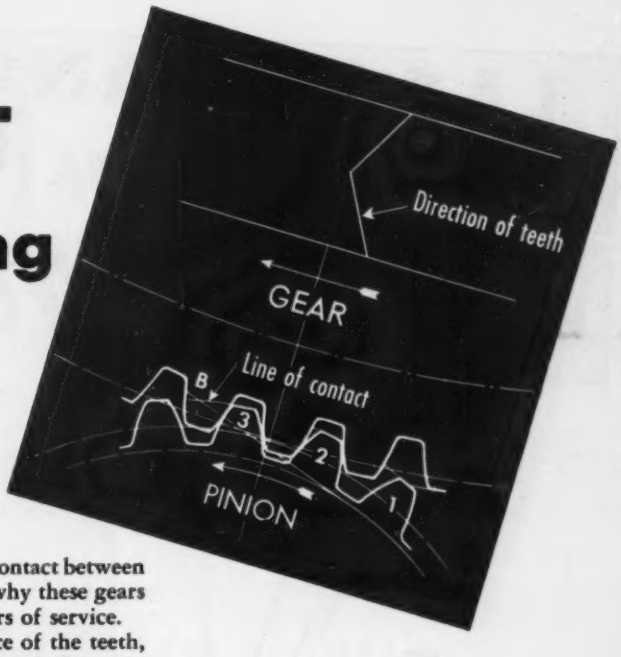
PLAIN — recommended for light work of two or more surfaces. Sizes: Round — 24" to 48"; Square 30" to 48".

HAND — recommended for several surfaces. Round — 24" to 30".

COMBINATION, PLAIN, HAND AND POWER FEED — has 18 power feeds. Sizes: Round — 36" to 60"; Square 36" to 60", Rectangular — 36" x 48" to 60" x 96".

GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN

BLUEPRINT for longer-lasting GEARS



This diagram, which illustrates the nature of the contact between a pair of Farrel-Sykes herringbone gears, shows why these gears continue to operate smoothly after so many years of service.

The lines of contact are oblique across the face of the teeth, and the pressure is evenly distributed over each tooth, from tip to working depth line. This means that there is no tendency for the contour of the teeth to wear unevenly.

The quiet, vibration-free performance of these gears results from extreme accuracy of tooth spacing, contour and helix angle, and other qualities inherent in the Farrel-Sykes method of gear generation. Precision manufacture and the use of highest grade materials also contribute to long gear life.

Farrel engineers are available to assist in working out unusual problems involving gears or speed reducers. Write for further information.

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONNECTICUT

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.

Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Detroit, Chicago, Memphis, Minneapolis, Portland (Oregon), Los Angeles, Salt Lake City, Tulsa, Houston, New Orleans

HERRINGBONE GEARS

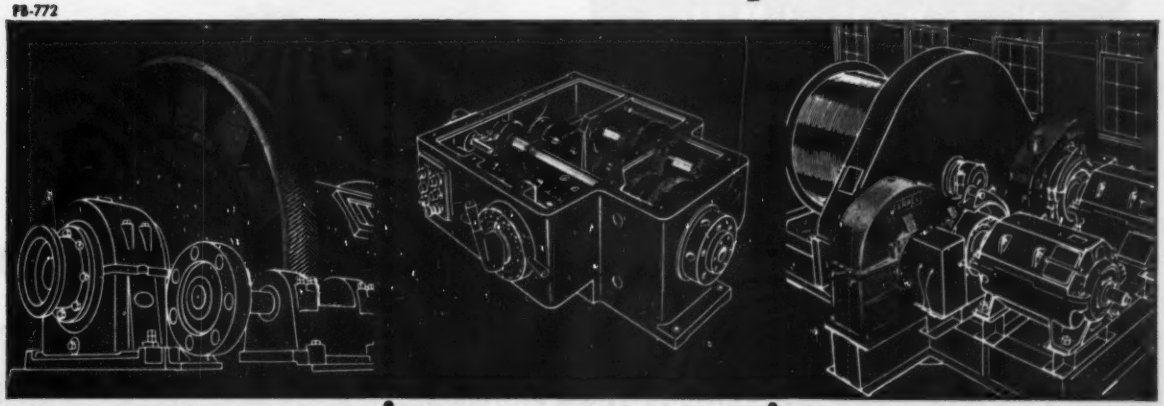
Farrel-Sykes herringbone gears are made in any size from ¼" to 20'0" diameter, for any power capacity and speed.

SPEED REDUCERS

Farrel speed reducing units are available in a wide range of ratios and capacities. Designs include single, double and multiple reduction units, right angle drives and drives to meet special requirements.

Farrel-Birmingham®

FB-772

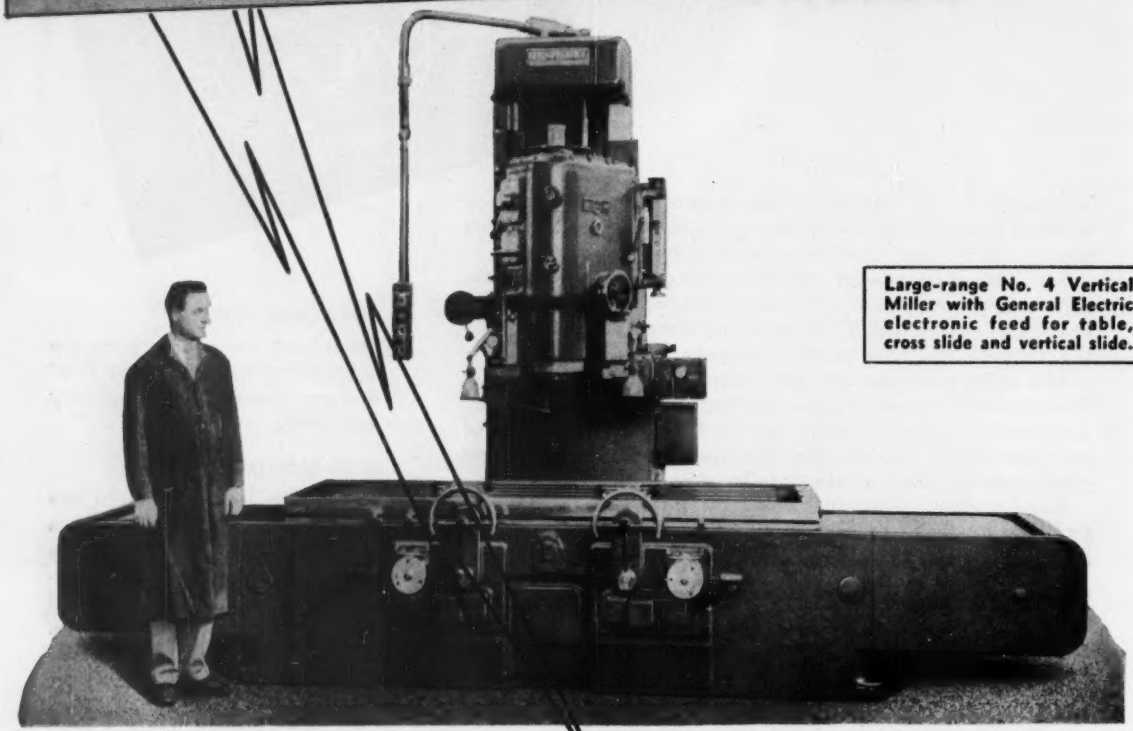


Ball mill equipped with Farrel-Sykes gears. The drive gear is 140" diameter, 18" face.

Farrel-Sykes herringbone gears used in the headstock of a lathe.

Skip hoist driven by two motors through Farrel speed reducers.

LARGE RANGE VERTICAL MILLER with "ELECTRONIC" FEED



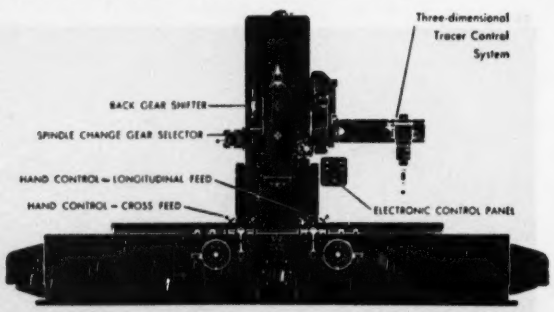
Large-range No. 4 Vertical Miller with General Electric electronic feed for table, cross slide and vertical slide.

Send for new No. 4 Miller catalog

REED-PRENTICE No. 4. Vertical Miller

SPECIFICATIONS: Machine Size	#4-60"	#4-96"
Longitudinal travel of table	60"	96"
Travel of cross slide	24"	24"
Table working surface	24 x 96"	24 x 132"
Feed range	½ to 25" per minute	
Spindle speeds 20 H.P. motor	45-1800 RPM	45-1800 RPM
30 H.P. motor	90-1800 RPM	90-1800 RPM

One–, two–, and three-dimension General Electric contour follower systems available. Full details on request.


Three-dimensional Tracer Control System
BACK GEAR SHIFTER
SPINDLE CHANGE GEAR SELECTOR
HAND CONTROL – LONGITUDINAL FEED
HAND CONTROL – CROSS FEED
ELECTRONIC CONTROL PANEL

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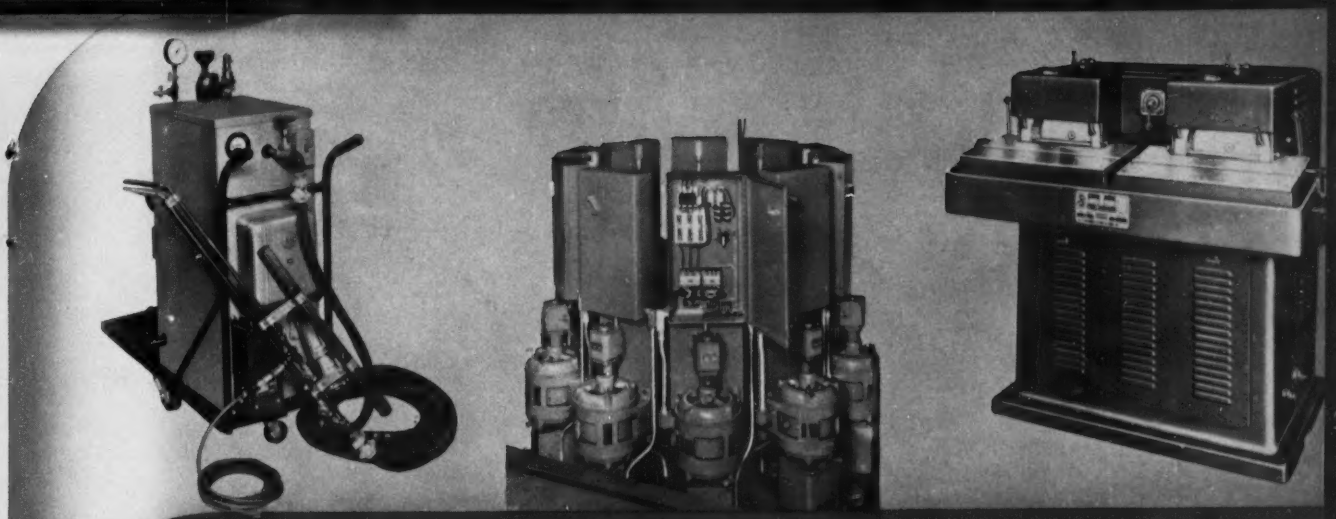


SPEEDYELECTRIC STEAM-JET CLEANER—a compact "RA" Starter makes possible a neat surface mount for easy access.

ALLEN TAPPER & THREADER—conveniently located panels house "RAC" Starters controlling the reversing spindles.

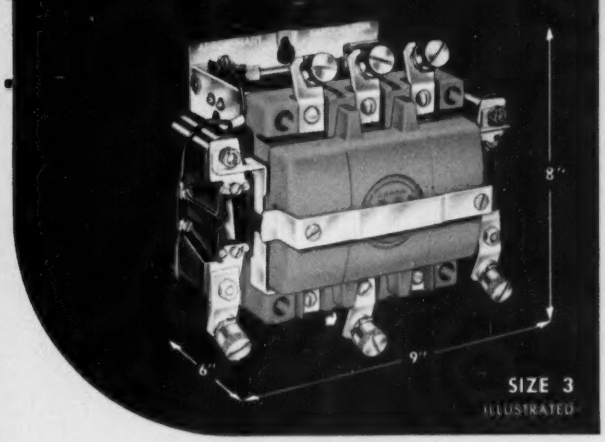
TWIN-TOOL GRINDER—A-H Controls mounted on the side are easily accessible to the operator, easily serviceable.

ARROW AH HART

ARROW-HART MOTOR STARTERS AND CONTACTORS

Serve Better and Longer

WITH MORE OUTSTANDING FEATURES



SIZE 3 ILLUSTRATED

JUST ½ THE SIZE and WEIGHT
— permits smaller control panels and cavities, better layout.

EASY INSTALLATION
— straight-thru wiring saves **30%** time and work, circuits are easier to identify.

EASY MAINTENANCE
— front-wired terminals . . . contacts readily accessible.

MORE EFFICIENT
— exclusive knee-action, bellcrank fulcrum mechanism multiplies leverage, increases contact pressure, takes less space.

GREATER ARC RESISTANCE
— by **55%** with alkyd type base and hood . . . individual arcing chambers.

HEAVY-DUTY CONTACTS
— positively aligned. Vertical operating position — sheds breakdown materials.

Better service is ***built into*** A-H Motor Controls. Not with just minor improvements, but through a new concept of motor control design . . . exclusive with Arrow-Hart. A functionally simple design, it skillfully balances all components for greatly increased efficiency. It's years ahead in providing dependable operation, maximum rated performance and long life. These outstanding advantages are available today as replacements for obsolete design or for improved product design of original equipment. Take the first step — buy a Type "RA" Motor Starter or Contactor, and compare it with the conventional type of controls.

SIZES AND TYPES ON THE REVERSE SIDE.

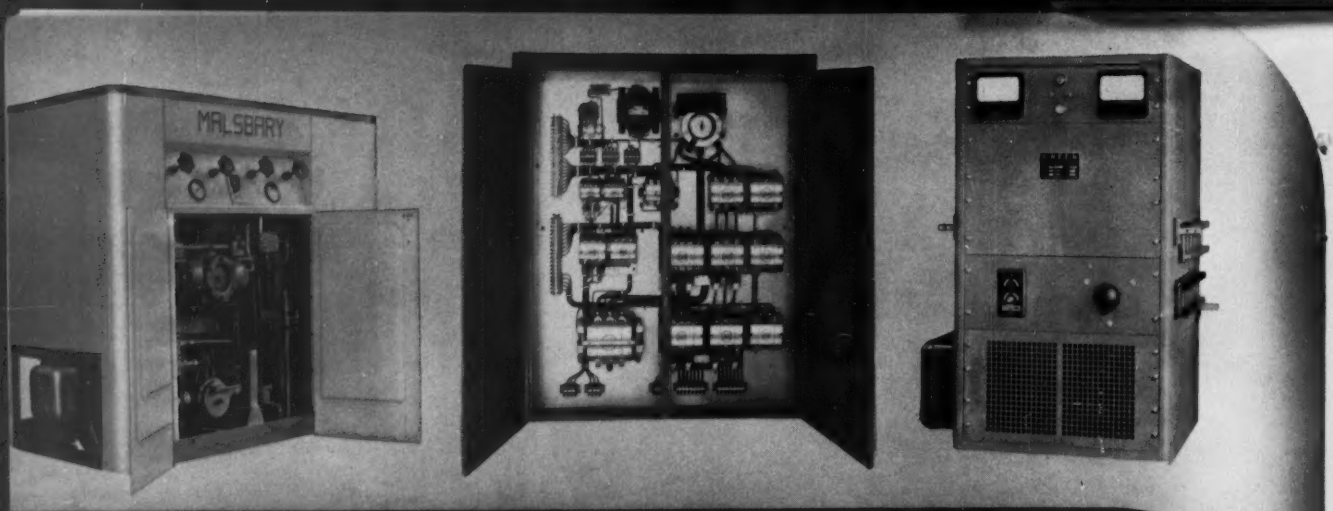
BUY WITH CONFIDENCE • PROFIT BY PERFORMANCE

THE ARROW-HART & HEGEMAN ELECTRIC CO., HARTFORD, CONN., U.S.A.

ELECTRICAL CONTROLS

ARROW AH HART

ESTABLISHED IN 1890



MALSBARY STEAM CLEANER — the push-pull "RA" Starter assembly ready for other components.

BATH CONTOUR FOUNDER CONTROLS — a panel per 25" x 44" x 10" bath: 3 Size 00 and 2 Size 3 Contactors, a Size 2 and a Size 4 Starter, a Size 1 and a Size 2 Reversing Starter, 2 Size 3 Two-Speed Starters and a Size 3 Reversing Contactor.

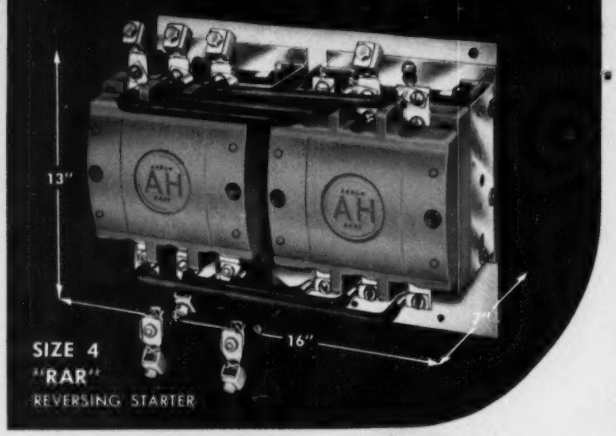
SIXTEEN MULTI-RECTIFIER — dependable control is assured by a "CRA" Contactor and A-M Push Buttons.

More and More PROGRESSIVE Companies are buying ARROW-HART MOTOR CONTROLS

A Complete Line

ARROW AH HART

Type "RA" Starters are supplied in sizes 0, 1, 2, 3, 4 and 5, including "RAR" and "RAS" Reversing and Two-Speed Starters, "RAC" Combination Starters, and "RCAR" Combination Reversing and "RCAS" Two-Speed Starters. There's a full range of NEMA enclosures for general service and for hazardous and exposed locations, including EXPLO-SAFE explosion and weatherproof housings. Type "CRA" Contactors are supplied in sizes 00, 0, 1, 2, 3, 4 and 5, including "RARC" Reversing Contactors.



SIZE 4
"RAR"
REVERSING STARTER

You'll find ratings, dimensions, weights and complete engineering data in the Arrow-Hart Catalog: INDUSTRIAL MOTOR CONTROLS. To receive your copy, just fill in and mail the coupon below.

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THE ARROW-HART & HEGEMAN ELECTRIC COMPANY
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HARDENING TIME CUT 62%

with TOCCO* Induction Heating

When minutes saved mean dollars earned, look to TOCCO Induction Heating

● Singer Manufacturing Co., makers of famous Singer Sewing Machines, reports the following results when they switched to TOCCO—hardening the shaft assemblies shown above. Note the operations eliminated through the use of TOCCO and the savings of 151.8 minutes per 100 parts.

OLD METHOD Operation	Min./100 Pcs.	TOCCO METHOD Operation	Min./100 Pcs.
Assemble on plating racks. .	23.0	eliminated	
Copper plate crank end . . .	43.0	eliminated	
Remove from plating racks .	15.0	eliminated	
Harden shaft and anneal crank	120.0	TOCCO harden and clean	92.5
Strip lead.	10.0	eliminated	
Strip copper and clean . . .	33.3	eliminated	—
Old method total time	244.3 minutes	TOCCO method total time . . .	92.5 minutes

Have you investigated TOCCO's time and cost savings possibilities for your hardening, brazing, forging or melting operations? It will pay you to write or send blueprints of your parts for analysis—no obligation of course.

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PARKER-KALON®

The Original

SELF-TAPPING SCREWS

NOW...

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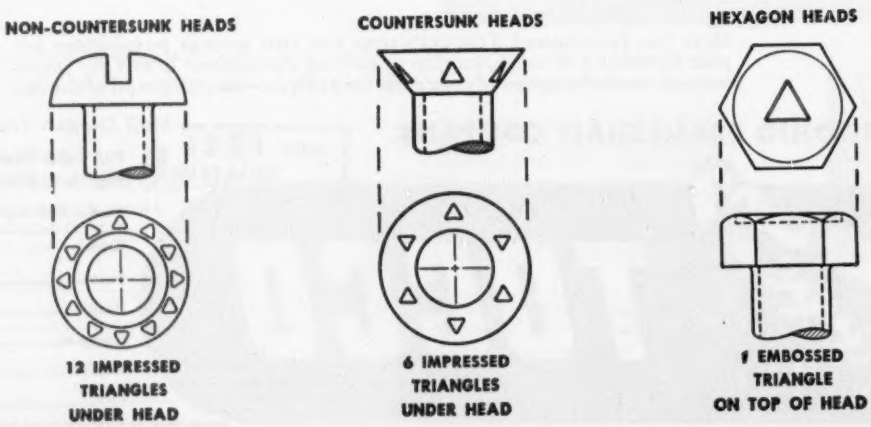
For Your Protection



Signed Like the hall mark on fine silverware, this triangle mark now impressed on all P-K Self-tapping Screws signifies the maker's pride of craftsmanship. This "signature" will serve for your protection against substitution.

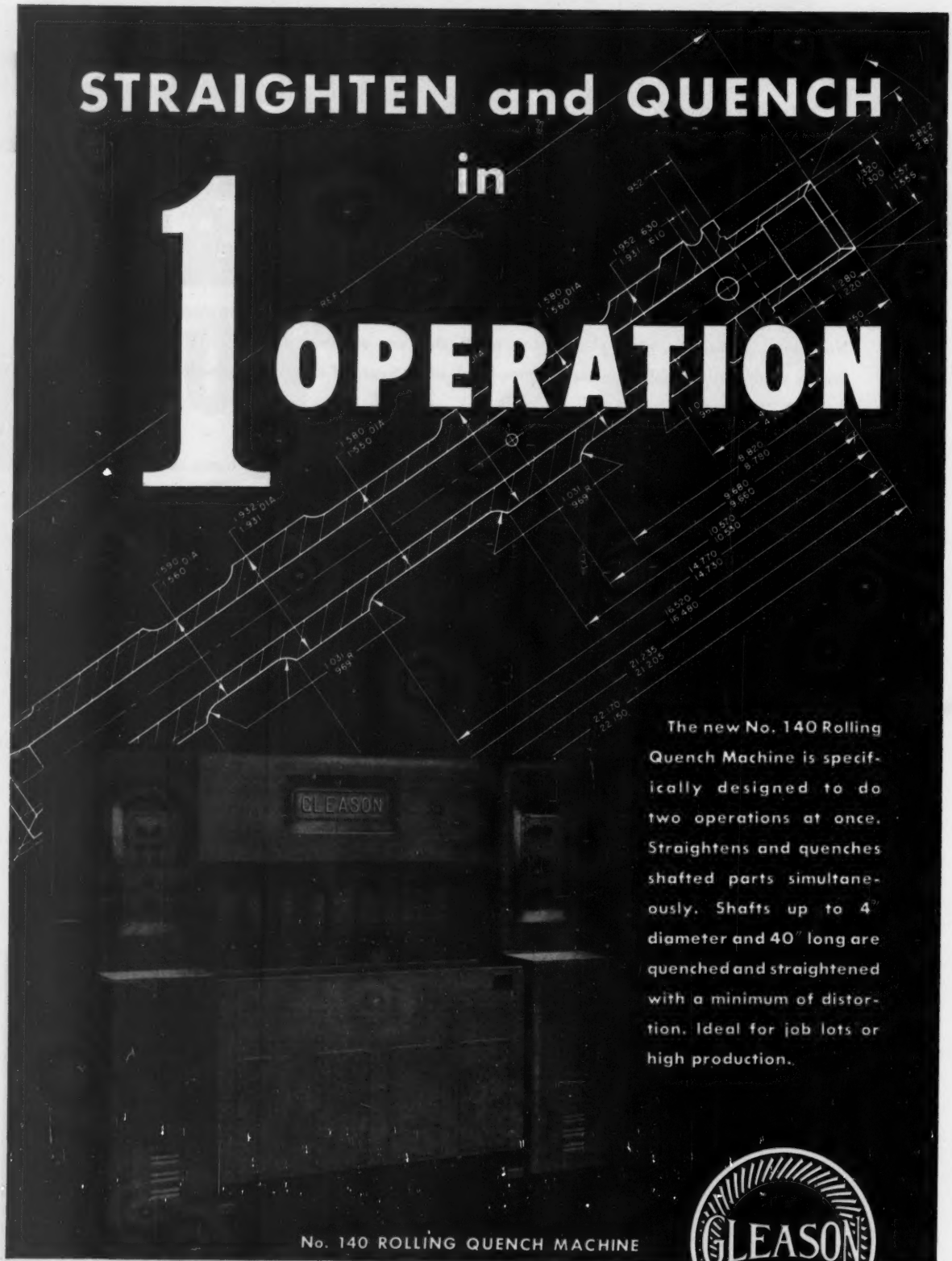
Certified Now, the P-K triangle mark will certify every screw that bears it as a genuine Parker-Kalon product, made by the *originators* of Self-tapping Screws. Now, you can be sure, when you see this mark, that you are using the *only* Self-tapping Screws made with the accumulated "know-how" of 40 years of enterprising leadership.

Guaranteed Now, identification goes beyond boxes or other containers and labels. The screw identifies itself, and when you see the P-K triangle mark you know it is the *guaranteed* screw, backed by the "Guarantee of Highest Quality" printed on every box. Look for the P-K triangle on the screws you buy and use. It's your one sure way to guard against job-slowing, parts-wasting screw failure . . . the way to make *planned* assembly savings *pay off*. Parker-Kalon Corporation, 202 Varick St., New York 14.

IF IT'S P-K IT'S O.K.

TRADE MARK.
REG. U.S. PAT. OFF.

STRAIGHTEN and QUENCH in 1 OPERATION



The new No. 140 Rolling Quench Machine is specifically designed to do two operations at once. Straightens and quenches shafted parts simultaneously. Shafts up to 4" diameter and 40" long are quenched and straightened with a minimum of distortion. Ideal for job lots or high production.

No. 140 ROLLING QUENCH MACHINE

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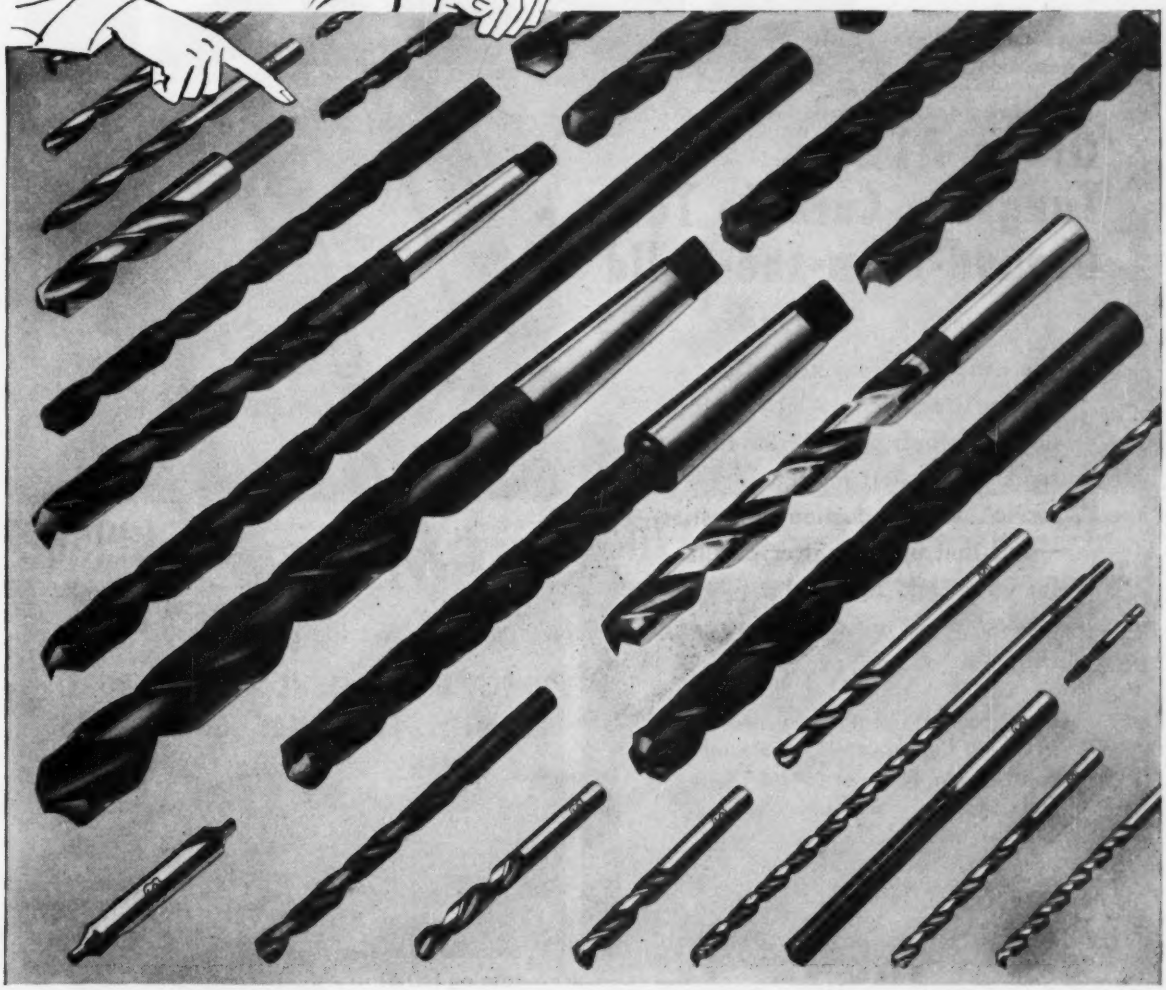
BUILDERS OF BEVEL GEAR MACHINERY FOR OVER 85 YEARS

1000 UNIVERSITY AVE. · ROCHESTER 3, NEW YORK

"Doc" *Red Shield* says:

"Cure production ills with STANDARD DRILLS"



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THE STANDARD LINE: *Twist Drills • Reamers • Taps • Dies • Milling Cutters • End Mills • Hobs • Counterbores • Special Tools*

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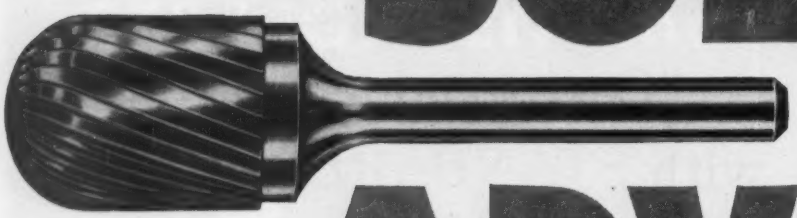

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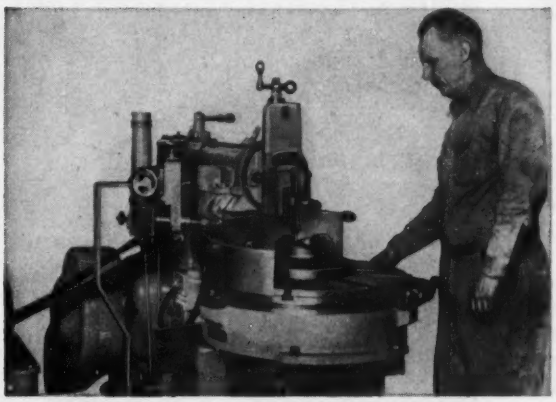
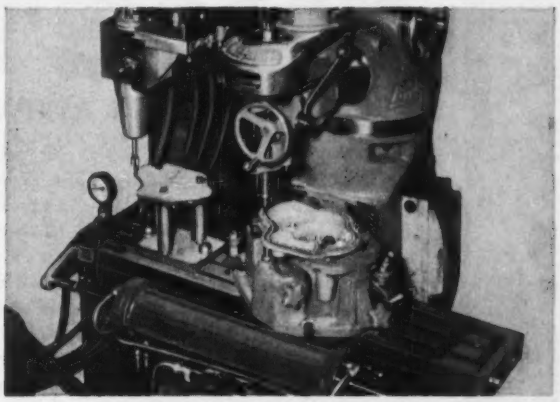
Why buy costly special equipment?

Convert your standard machines to produce difficult jobs with *Turchan* DUPLICATORS

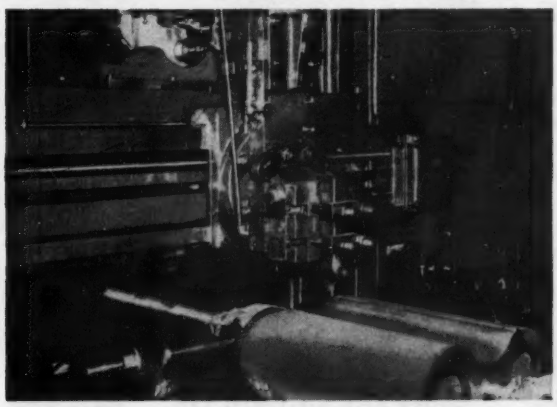
- The efficiency of almost any standard machine tool can be greatly increased with the Turchan.
- Users report savings in costs from 80% to 600%.
- Intricate profiles and contours easily accomplished.
- No special forming tools or skilled help required.
- Greatly expands variety of operations possible.
- Handling and set-up time are reduced over half.
- Accuracies + — .001" and finer surface finish.
- Completely eliminates chance for reject pieces.
- Instantly reconvertible to manual operation.



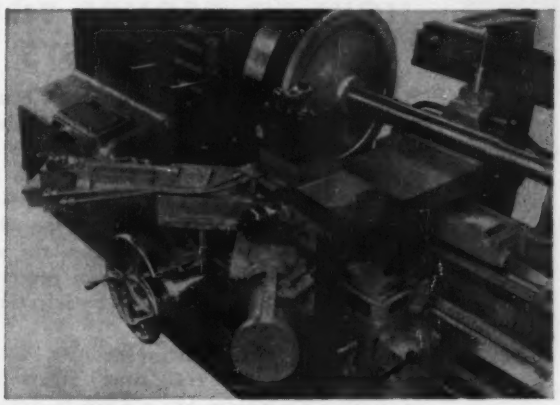
SHAPING: While producing this irregular contour, the tracer guides the varying height of table. Result: faster, automatic precision control.



MILLING: Contouring of unusual shaped washing machine part to close tolerance. Turchan method cut time to ⅛ of conventional way.



PLANING: Standard planer gains versatility with the Turchan attachment; machines contours of a blower section as easily as straight work.



TURNING: Turchan dual 45° attachment machines shaft and faces disc of this jet engine part in the same set-up. Simplifies all difficult jobs.

TELL US YOUR PROBLEMS: Send a blueprint or model of job with specifications for an estimate. Give make and model number of machine. Our engineering department is at your service, without obligation, to show you how to do better work, faster, at lower cost.

Write for New 20-Page Catalog

Turchan FOLLOWER MACHINE COMPANY

8259 LIVERNOIS AVENUE · · · DETROIT 4, MICHIGAN

IT'S QUIET ON THE MEZZANINE ...WHILE THE MEN BELOW

rivet

...NOT 15 FEET AWAY!

This is a riveting line at the Irving Subway Grating Co., Long Island City, New York. *Yet you cannot hear the riveting!* Why? Because it's done with Hannifin "Hy-Power," the modern cold-squeeze riveting method.

Compact "Hy-Power" Portable Yoke Riveters quietly exert the force. The power is supplied by "Hy-Power" Hydraulic Pressure Generators (you see them right up there beside the man who is consulting the files) . . . compact, single units that include motor, pump, oil reservoir, control valves and high pressure intensifier.

HOW TO REDUCE YOUR RIVETING COSTS

Do it the "silent squeeze" way with Hannifin portable and stationary yoke riveters which are available in capacities from 7½ to 100 tons (more in multiple). It's a fast method. It's a method that assures complete uniformity of every rivet. It's a safe method; for while a touch of a button starts the ram, the stroke may be interrupted and the ram reversed at any point in the cycle, simply by releasing the control button.

See your Hannifin representative who will demonstrate why "Hy-Power" riveting and punching equipment has a place in your production picture. Hannifin Corporation, 1109 S. Kilbourn Ave., Chicago 24, Illinois.

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The complete story of Hannifin "Hy-Power" Hydraulics. Your copy sent on request.

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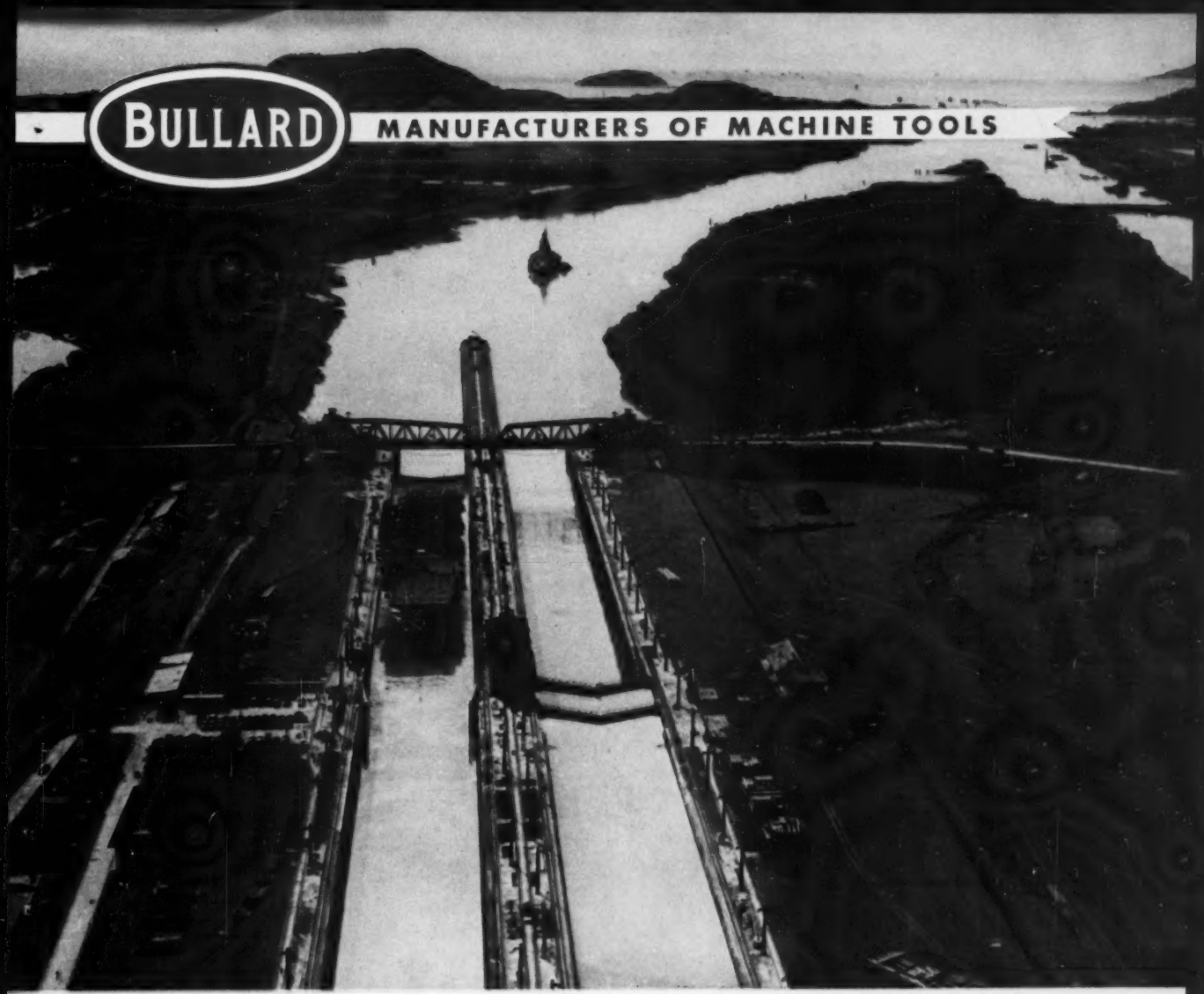
Air and Hydraulic Cylinders • Hydraulic Presses • Pneumatic Presses • "Hy-Power" Hydraulics • Air Control Valves



Panama Canal, Pedro Miguel Locks

United Press Acme Photo

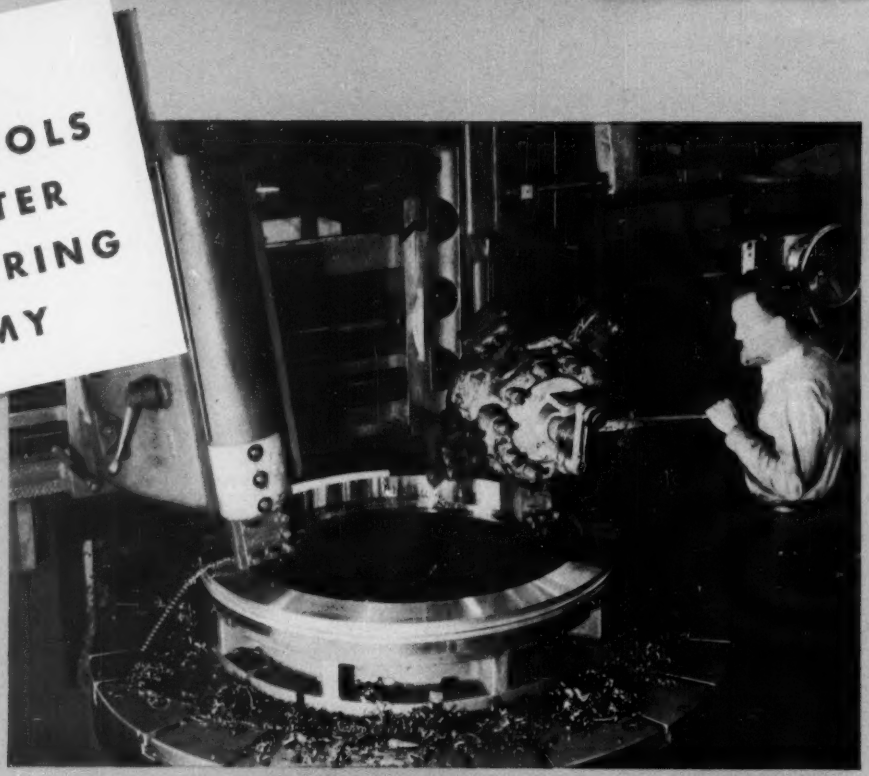
The Invisible Background of Industrial Progress

Panama Canal, a United States acquisition about 1904, was officially opened July 12, 1920. The total cost to our country was $375,000,000. Earth removed was 239,000,000 yards. However, American ingenuity, incentive and industrial progress through Machine Tools and the practical use of mechanical equipment — such as: plows, derricks, stonecutters, drills, shovels, steamboats, dredges, pile drivers, tracklayers, locomotives, steam shovels and other products of mechanical ingenuity realized a 400-year-old dream of a passage between North and South America. In 1949 almost 10,000,000 tons of shipping passed through the Canal from east to west, and from west to east approximately 15,500,000 tons. Statistics show the distance saved between New York and San Francisco is nearly 8,000 miles with only a matter of six to eight hours for a vessel to make the passage. Ships of 1,000 feet in length are accommodated in any of the five locks in the Canal. ★ Today because of *Modern Machine Tools* and mechanical equipment such projects consume considerably less time than "The Big Ditch".

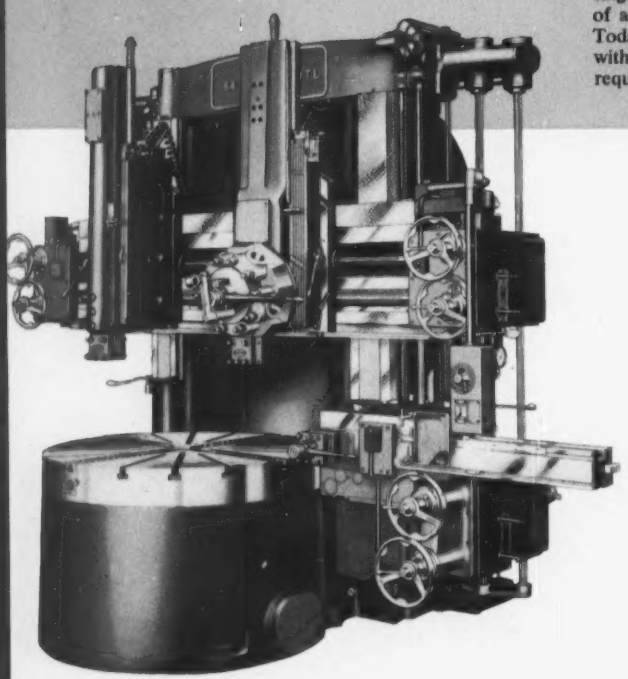
★ *For greater manufacturing economy REFER to next page.*

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

BULLARD MACHINE TOOLS FOR GREATER MANUFACTURING ECONOMY



In the background of "Industrial Progress" lies the development of the name Vertical Turret Lathe. This name, an offshoot from the old single-head boring machine, was established in 1909 by the inception of a vertical boring mill having a sidehead, which Bullard pioneered. Today the modern conception is the Cut Master Vertical Turret Lathe with its design and engineering in keeping with manufacturing requirements.



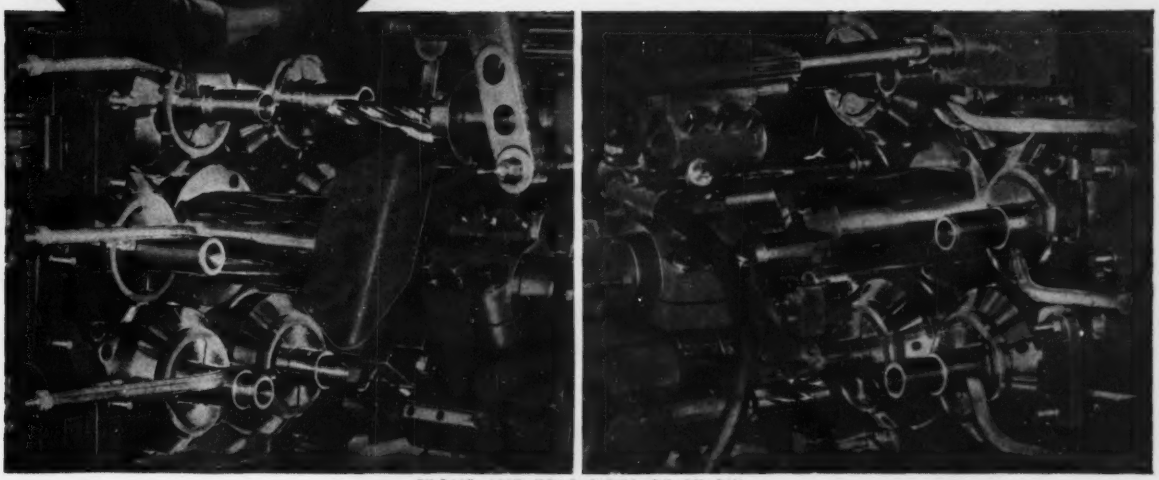
The Cut Master is exactly, in all respects, what its name implies — accurate and efficiently productive. Truly a machine for manufacturing economy. These machines are widely reputed to be of great adaptability on almost all classes of work. Bullard Machines of this type, because of their wide range of sizes, are ideally suited for installation aboard many of the United States ships of defense for their maintenance requirements. Furthermore, Bullard Machines are used in the industries which manufacture for the large construction projects where the accuracy of the finished product determines its reliability for the functions required. Original machining accuracy of work assures reliability with minimum maintenance costs over long periods. Bullard Cut Master Vertical Turret Lathes give assurance to your customer that the product bearing your name is of the highest quality.

BULLARD

Time saved is money earned. Write now for information.

THE BULLARD COMPANY BRIDGEPORT 2, CONNECTICUT

NO NEED TO "SETTLE" FOR LESS



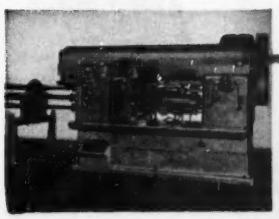
FRONT AND REAR SIDES OF 2⅝-SIX

Multiple Spindle Bar Automatics produce more work per square foot of floor space than do other types of metal cutting machine tools. But, when *one* spindle is "down" *all* are "down." It's why dependability will always be the outstanding requirement of the "Automatic."

So many factors are involved in dependability that any weakness in design, engineering, material, or construction, will eventually contribute to higher costs of operation and maintenance.

Part of any new machine's service to the prospective user is the availability of *full* information. No prospective purchaser need "settle" for less. At least it's that way with CONOMATICS.

In producing the piece shown, on a 2⅛-SIX, the eccentric forming attachment (see upper right illustration) combines the well known CONOMATIC facilities of form tool support and "all position" attachment spindle drive.



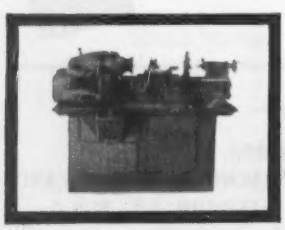
A Comparison of ALL Automatics is in favor of Cone

Conomatic} CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

...another product from the plant of precision!

9" x 24" Tool and Gage-Makers' Lathe with Electronic Motor Control

Now you can have the advantages of quiet, simple, modern Hendey Electronic Motor Control on the Hendey 9" x 24" Tool and Gage-Makers' Lathe. These advantages include stepless spindle speeds from 25 to 3000 R.P.M. by potentiometer control of both field and armature of the 3 H.P. d-c motor. Exceptionally close speed control is obtained even under changing load. I.R. compensation gives full torque at low speeds over the complete armature control range. A full stop from maximum speed is accomplished in approximately 1½ seconds. Starting, stopping or reversing, even at 3000 R.P.M., is accomplished smoothly and rapidly. This new drive is optional equipment, and full information is available in our new 9" x 24" Lathe catalog. Write for your free copy! It gives full details on the new drive as well as other features of the Hendey 9" x 24" Lathe, which guarantee precision output with minimum effort.



MODERN Hendey

THE HENDEY MACHINE CO., INC.
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BRANCH OFFICES: New York, Chicago, Boston, Detroit, Rochester, Los Angeles, San Francisco
REPRESENTATIVES: Philadelphia, Cleveland, Pittsburgh

WE FORESEE YOUR DIEMAKING NEEDS ...and meet them!

More than 30 years' *past* experience in supplying diemakers' needs has taught Danly how to foresee *future* needs. In almost every instance, there are *standard* Danly Die Sets and *standard* Danly Diemakers' Supplies to meet your diemaking specifications.

You can rely on Danly's reputation for precision and dependability when you start your tooling program. You can be sure of prompt delivery from completely stocked Danly branch assembly plants located in nearly every major toolmaking center.

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LINDE'S News of Metalworking

Worn Parts Rebuilt Economically by UNIONMELT Welding

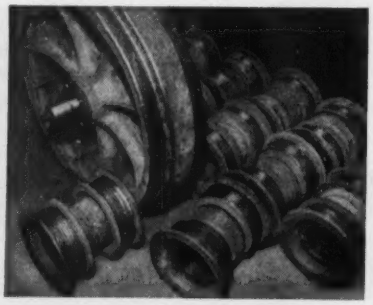
Repair of worn tractor parts is most practical and economical with specially developed fixtures on which standard UNIONMELT welding units are mounted. The metal deposited by UNIONMELT welding is so smooth that no grinding or finishing is required. Experience indicates that resurfaced areas will wear as long as new parts.

The Berkeley "Conservall" fixture is designed especially for rebuilding crawler tractor track links or rails without disassembling them. The track is placed in a trough and clamped in position. A LINDE side-beam carriage

Tractor rail links rebuilt in "Conservall" machine by UNIONMELT *welding. Cams automatically control welding action for each link.*

moves the UNIONMELT welding equipment over the positioned track and the welding of each link is automatically started, stopped, and accurately controlled. Rollers, idlers, sheaves, and other circular work can also be welded or resurfaced on another section of the machine.

The "Leader" machine is also available for rebuilding both cylindrical and flat parts. Rollers are rebuilt on top of the machine. Larger parts, such as idlers, are mounted in the chuck at the side of the machine as shown. With the flat work attachment, parts such as disassembled track rail links, grousers, bulldozer blades, end bits and fabricated members can be resurfaced easily. This attachment is operated by a gear which is mounted in the chuck.



These tractor rollers and an idler were rebuilt at a speed of 30 in. per min. by UNIONMELT *welding.*

With both machines, the wheels can be tilted for rebuilding the flanges. It takes only 80 to 90 minutes to rebuild a D-8 track roller. Idlers take about three times as long.

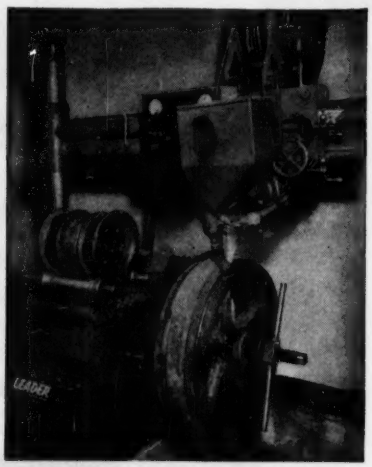
OXWELD 1928 rod is normally used in making these repairs. When wear is excessive, OXWELD 296 rod is sometimes used for the initial buildup which is then finished with OXWELD 1928 rod. For such resurfacing, use either Grade 80 or Grade 90 UNIONMELT welding compositions.

For some services, a finishing pass with a higher alloy tube rod is applied to produce a harder surface. While material of almost any hardness can be applied, one combining hardness and toughness lasts longer than one of higher hardness that tends to spall and chip. As deposited, OXWELD 1928 material has a hardness of about Rockwell C-25, but in service the working surfaces actually develop properties which cause them to outwear deposits that are substantially harder.

Advantages of UNIONMELT Build-up

UNIONMELT welded resurfacing is especially attractive with these automatic machines which readily permit deposit rates of 20 lbs. per hour. Savings in time and the advantages of a smooth uniform deposit justify the initial investment in automatic equipment. Important in these times is the conservation of metal realized with the process. The use of approximately *one hundred pounds of weld metal saves replacement of 2,000 to 3,000 pounds of new parts.*

LINDE's engineers and technicians will be glad to give further information about UNIONMELT welding. Telephone or write today.



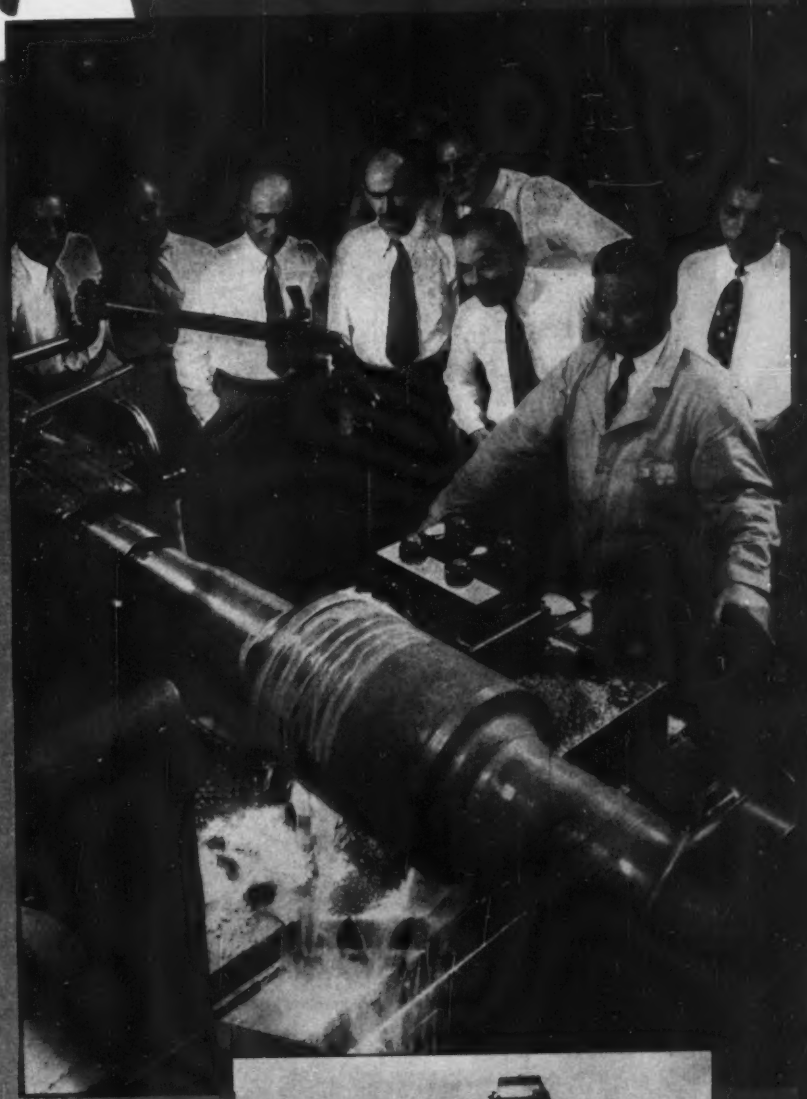
UNIONMELT *welding head on "Leader" fixture rebuilds rollers and idlers. Rollers are welded on top of the machine, idlers at the side, and flat parts, depending on their size, can be welded on top of the machine or in the flat work attachment.*

LINDE AIR PRODUCTS COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: Dominion Oxygen Company, Limited, Toronto

The terms "Linde," "Oxweld," and "Unionmelt" are registered trade-marks of Union Carbide and Carbon Corporation.

It MUST have been good!

There are times when expressions speak louder than words.

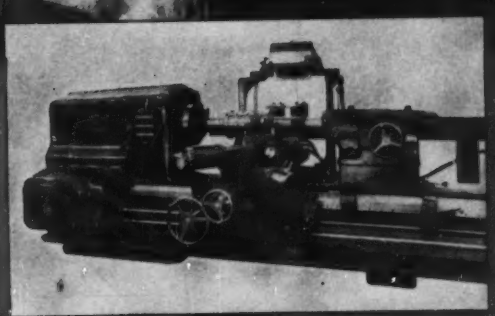


Here's a group of distinguished steel mill roll executives watching a demonstration on a 26" Capacity "AMERICAN" Hydraulic Roll Lathe—judge for yourself whether or not they are satisfied with what they saw.

These machines are performing "miracles" in savings in many of the best known roll shops in the country. They have introduced a brand new machining technique that has revolutionized the art of roll turning. They reproduce work shapes from a template faithfully and accurately not only on steel mill roll bodies and necks, but on such work as spindles, motor shafts, valve stems, step shafts, piston rods, axles and a wide variety of chucking work having irregular contours.

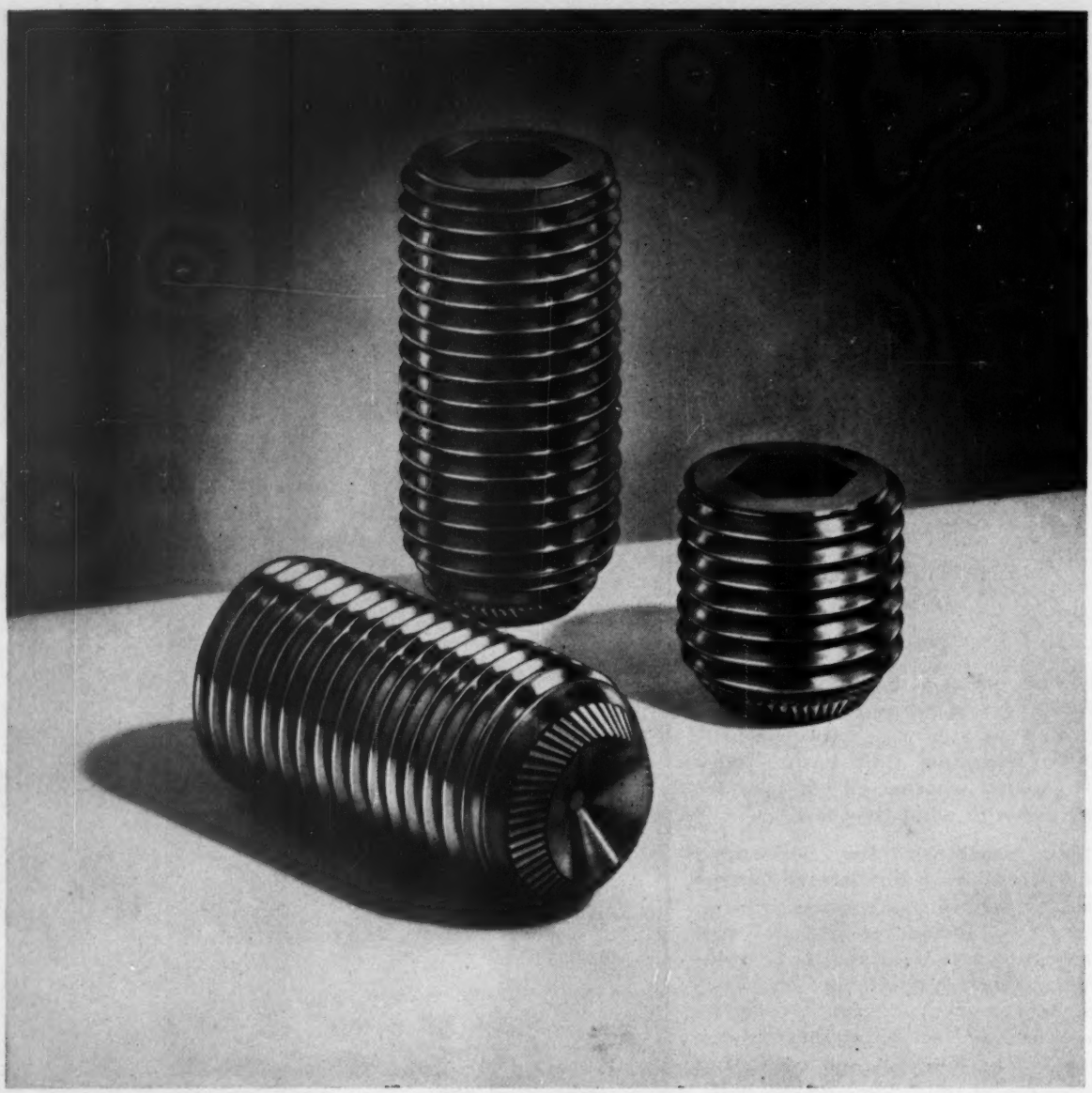
Evidence from hundreds of installations proves beyond a shadow of a doubt their leadership as top-flight cost reducers. Was there ever a time when cost reduction was more urgently needed?

If it's proof you want just drop us a line—no obligation.

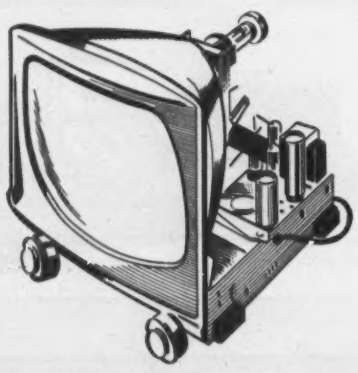


THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS



UNBRAKO SELF-LOCKING SOCKET SET SCREWS feature the following advantages: knurled cup point that won't work loose; accurate hex socket for nonslip, positive drive; fully formed threads—Class 3 fit; heat treated alloy steel for strength; standard sizes—#4 to 1"—in a full range of lengths.



USE UNBRAKO SELF-LOCKING SOCKET SET SCREWS wherever ordinary cup point set screws are used . . . on radios, television sets and electronic equipment.

On refrigerators, washers, other household appliances

9 times out of 10 a standard UNBRAKO will do the job

A special socket screw may not be necessary, a standard UNBRAKO usually does the same job—much cheaper. Your local industrial distributor stocks Standards. He gives immediate attention to your requirements, and such extras as special delivery to your plant. Write for a copy of UNBRAKO Standards. SPS, Jenkintown 19, Pa.

UNBRAKO® SOCKET SCREW DIVISION

SPS
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On power mowers, power saws and other power tools.

UNBRAKO Standards—as listed in the SPS Catalog—are stocked by leading industrial distributors everywhere.

Get the most out of your

LELAND-GIFFORD

DRILLING MACHINES

MEMBER

LUBRICATE AS INSTRUCTED

Like all fine machinery, your Leland-Gifford drilling machines deserve the best care — including proper lubrication. Over-oiling can be as harmful as neglecting to oil. Adopt a daily and weekly lubricating routine, always using moderation. Better still, follow the recommendations in your instruction manual.

A small point? Yes . . . but important! Leland-Gifford Drilling Machines are built as trouble-free as master craftsmanship and long experience can make them . . . with totally enclosed motors, spline lubrication wipers, oil mist lubricated spindle bearings and many other features to insure lasting precision and safe, dependable operation. But neglect or abuse can impair the performance of even the finest equipment. With reasonable care and maintenance, your Leland-Gifford Drilling Machines will keep on producing accurate holes year after year. Remember, you are making a valuable contribution to the defense effort when you take the best possible care of your production equipment.

SAVE TIME — CONTACT THE OFFICE NEAREST YOU

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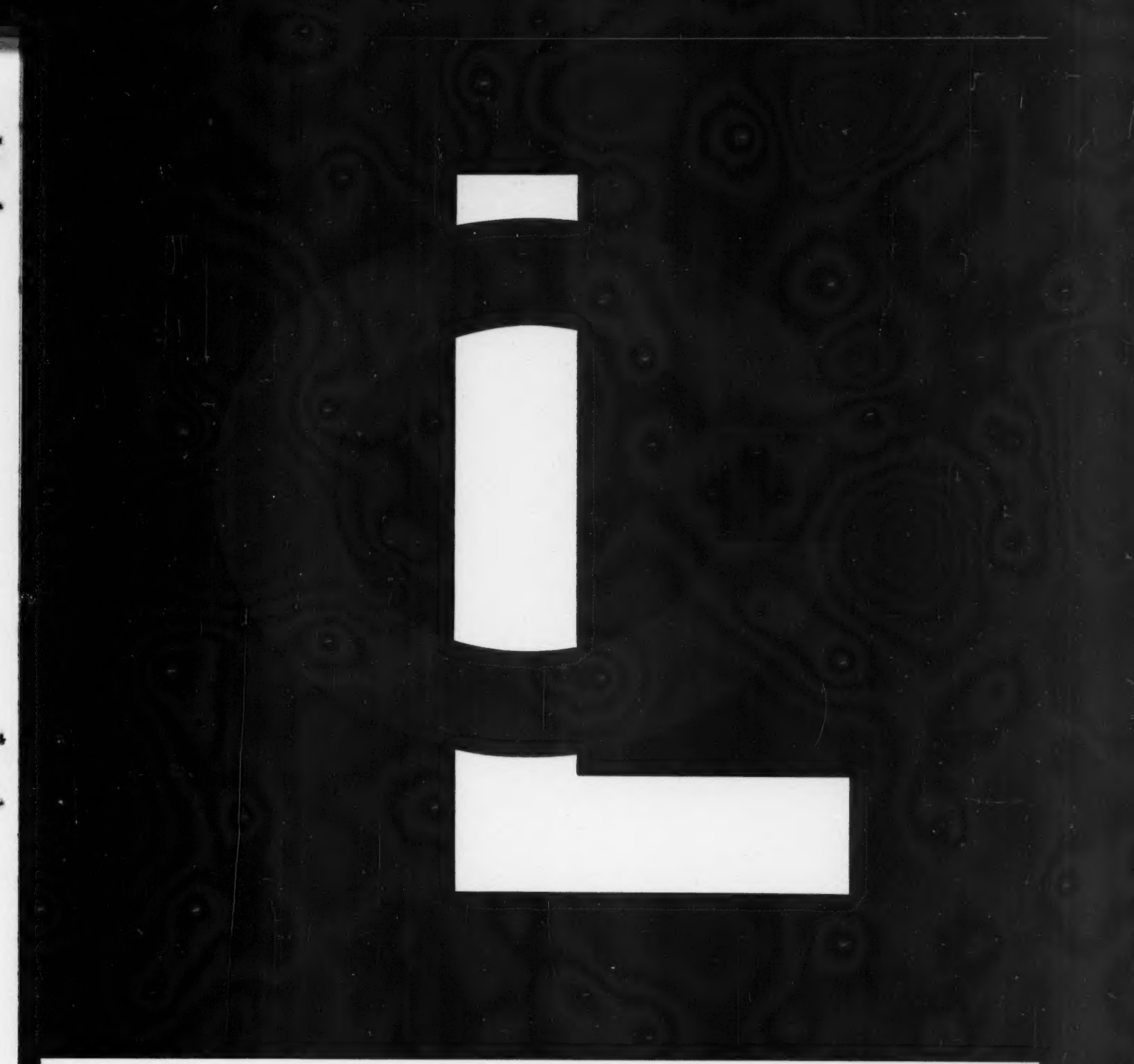
Drilling Machines

WORCESTER 1, MASSACHUSETTS, U. S. A.

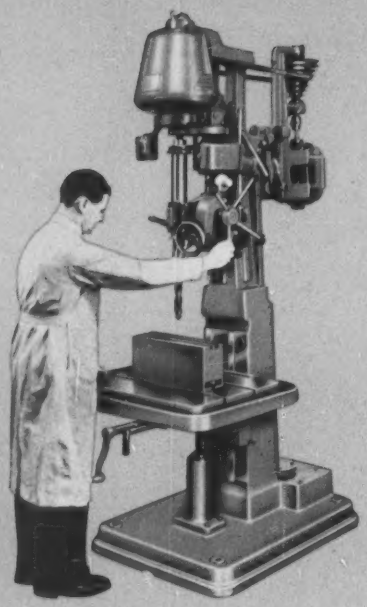


Cincinnati Lathes and Drilling Machines are so advanced that they deserve a new trade-mark — and here it is. You'll find it easy to remember, and well worth remembering. It stands for the company which designs, engineers, builds and backs up the most modern line of light and medium duty lathes (engine, toolroom and gap bed models) as well as drilling machines to cover practically all your drilling requirements. Write for catalogs and the name of your nearby CL dealer. He's always at your service.

best buys in their class!

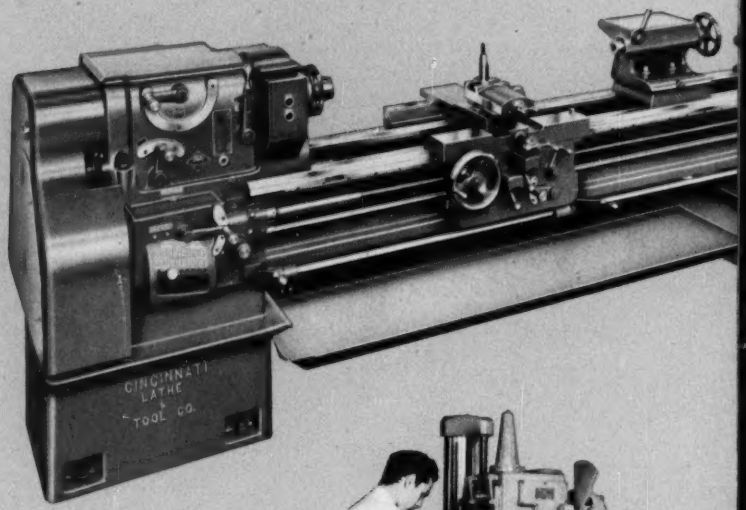
CINCINNATI LATHE & TOOL CO.

CINCINNATI 9, OHIO, U. S. A.

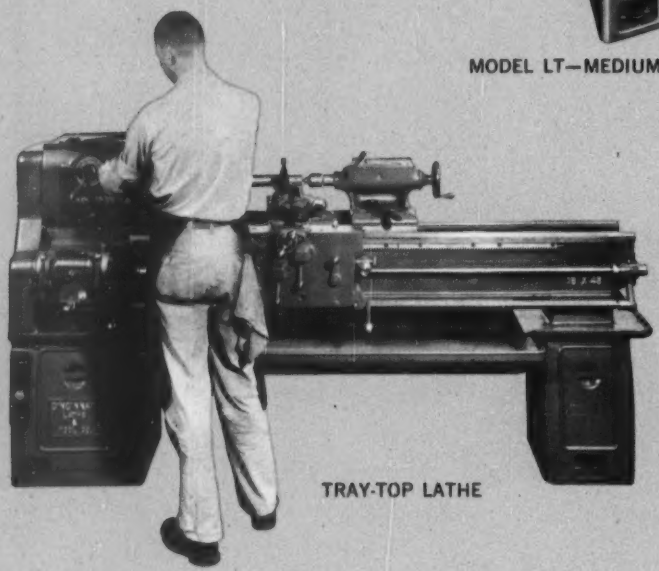


21" SLIDING HEAD BOX COLUMN FLOOR DRILL

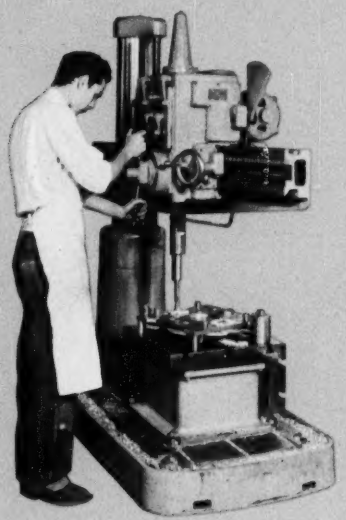
CINTIDRILLS: The complete, balanced line of drilling machines for all your drilling requirements for holes 1" OD and under. Complete line includes 3'-7" Radial, 21" Sliding Head (Box or Round Column), 21" Stationary Head, 16" 5000-10000 RPM, 16" 3000 RPM, 14" 3000 RPM for medium duty, 16" and 18" Royals for light duty. Bench, floor, and multi-spindle models. Nationally distributed.



MODEL LT—MEDIUM DUTY LATHE



TRAY-TOP LATHE



3' ARM, 7" COLUMN RADIAL DRILL

CINTILATHES: The complete, balanced line: Tray-Top for light duty (engine, tool room and gap bed models), Model LT for medium duty (engine and gap models). All geared headstocks, flame-hardened and ground bedways, and many other fine features at minimum investment.
Swing sizes: Tray-Top—10", 12½", 15", 18", Model LT—16", 18", 20", 24".
Write for catalogs and name of your nearest dealer.

best buys in their class!

CINCINNATI LATHE & TOOL CO.

CINCINNATI 9, OHIO, U. S. A.

"SINCLAIR Cutting Oils Increased Tool Life 33%"

"The Highland Machine and Screw Products Co. (Highland, Illinois) specializes in automatic screw machine work...

...therefore quality lubricants are a MUST for our equipment," states President C. J. Zimmermann.

By experience, Mr. Zimmermann has found that "Sinclair WILKUT 'A' not only increased tool life on our Brown & Sharpe Automatics by approximately ⅓, but it also improved the finish for the machining of non-ferrous metals and free machining cold rolled steel. In addition, because of the non-corrosive action of WILKUT 'A', both ferrous and non-ferrous metals can be run on the *same machine*.

"We also find Sinclair UMBRA® Cutting Oil a 'natural' for threading and machining of the more critical steels. We *are convinced* that the performance of Sinclair lubricants has minimized maintenance and operating costs in our plant."

Invite a Sinclair Lubrication Engineer to consult with your Maintenance Superintendent by calling your local Sinclair Representative or write to Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

SINCLAIR CUTTING OILS and COOLANTS for Metal Cutting

(WILKUT – Reg. U. S. Pat. Off.)

NOWHERE ELSE on earth....

can you command Motch & Merryweather's *Unrivalled Experience!*

...A KNOW-HOW THAT SPRINGS FROM MANY YEARS OF BUILDING CIRCULAR SAWING MACHINES, BLADES AND BLADE GRINDERS, AND CORRELATING "ALL 3" PROFITABLY ON THE JOB

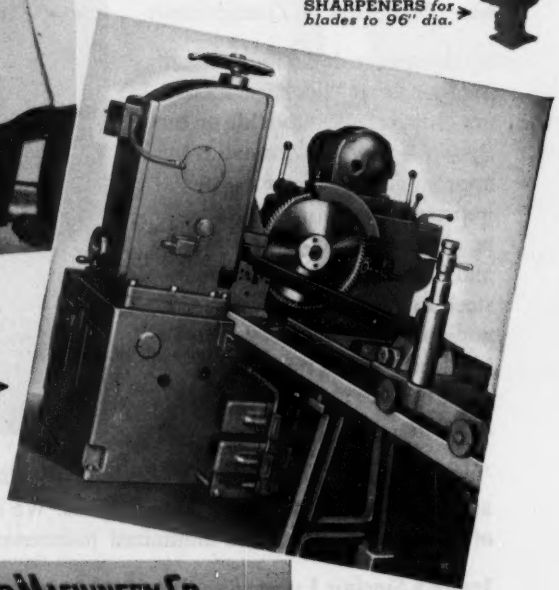
Motch & Merryweather's unmatched experience in the field of circular sawing brings you a know-how which insures profitable operation — *invariably.* To sign an order for an M. & M. machine is to be sure of complete satisfaction. Your purchase will perform as it should. We will see to that — *invariably.*

MACHINES *for cutting off to 36" dia.*

CUT-OFF BLADES *up to 96" dia.*

SHARPENERS *for blades to 96" dia.* →

MP/SF



• *Motch & Merryweather No. 2 Automatic Circular Sawing Machines cut off ferrous or non-ferrous metals up to 6" fast, clean, without burrs, profitably.*

Manufactured by — THE MOTCH & MERRYWEATHER MACHINERY CO. —
CLEVELAND 13, OHIO
Builders Also of Production Milling, Vertical Turning, Automatic and Special Machines

Only M & M builds ALL 3: CIRCULAR SAW · SAW BLADE · BLADE GRINDER

PRODUCTION-WITH-ACCURACY • MACHINES AND EQUIPMENT

if you had a few million to make...

you'd analyze this Army Ordnance job in terms of *end results*—machines are only a *means* to profitable ends.

You would make certain that one basic production unit gave you maximum number of operations—because extra equipment for doing any one or more of the 16 operations in a separate set-up would increase machine investment, floor space and man-hour costs.

You would want to know "how fast?" so to establish dependable production schedules—not theoretical output, but a guaranteed average of gauge passing pieces at each work turn. Our approach to this is through a vast experience in tooling—ingeniously engineered in a way to get the most out of each job.

These are precisely the end results which led many firms now producing this Ordnance job in million lots to specify—

Acme-Gridley Multiple Spindle Automatics

Your particular work is different, but only in form and size. Ask your engineers to talk with ours about *end results.* This practice has resulted in our sales of more than 45,000 machines.

JOB FACTS:

Part—Steel Container
Size—3" long x 1⅝" diam.
Material—FS1117
Operations—16 including shaving all over, 2 rolled threads, knurl and tap, all class 2 threads and .002 limits on front flange.
Machine time—36 seconds, 100 per hour.
Machine—Acme-Gridley 6 spindle 1⅛" Bar Automatic.

The NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics, 1-4-6 and 8 Spindle —Hydraulic Thread Rolling Machines—Automatic Threading Dies and Taps—Limit, Motor Starter and Control Station Switches—Solenoids—Contract Manufacturing.

Automation speeds
output on
rotary gear finishers.

870-A GEAR FINISHER

GEAR CUTTING
GEAR FINISHING

Complete Equipment
For Gear Production

GEAR LAPPING
GEAR CHECKING

AUTOMATIC SHAVING *for* "AUTOMATIC" PINIONS

Two hundred wide-face (2.490") automatic transmission pinions (1.327" O.D.) are shaved automatically every hour by one operator on two of these conveyorized 870-A Universal gear finishers. The operator merely loads the hobbed pinions in the hopper, which automatically gauges each one for size and helix angle. He removes the finished pinions from the apron at the end of the mesh ejector conveyor. With Michigan's modified underpass method of shaving, these long pinions are shaved in only 24 seconds total cycle time while using comparatively narrow shaving cutters. The 16 tooth, 18 pitch, 20° pressure angle pinion has a 15° 47' 48" right hand helix angle. Pinions are all shaved to well within the manufacturer's close tolerances for finish and accuracy.

Automation on Standard Machines

Should any Michigan automation-equipped shaving machine be needed at any time for shaving another gear, it may be converted to standard operation. Any pinion, gear or cluster gear, within the capacity of the gear finisher, may then be accurately shaved, either in job lots or in high production.

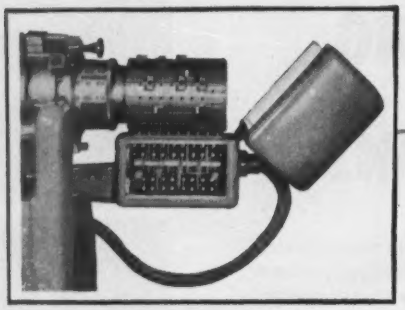
Ask for Bulletins on these machines by Model Number

GEAR PRODUCTION HEADQUARTERS

MICHIGAN TOOL CO. — Michigan Tool Company — Complete from blank to finished gear equipment

7171 E. McNICHOLS RD. • DETROIT 12, MICHIGAN, U. S. A.

You'd have to see the Gildematik 16-station Turret Lathe in action to believe all it does!



Speeds, feeds and direction of rotation for each of the 16 tool positions on Gildematik vertical drum-type turret can be *preset* in automatic cycling sequence by trip dogs on protruding end of turret. On indexing from one tool hole to next, trip dogs actuate electrical servo units, which pass on impulses to hydraulic controls. Speeds, feeds and direction are shifted instantaneously. *Right:* Gildematik RV 50 on the job at Special Screw Products Co., Bedford, Ohio.

Drum-type turret has electro-hydraulic preselection of feeds and speeds

Just imagine these operating features on your production line:

16 tool positions to carry bar through complete machining cycle to fine finished part—no secondary operations. Cuts machining time up to 50% on small work.

Automatic cycling by simple preselector controls! Electro-hydraulic servo units engage preset speed (from 11-2000 rpm), feed and direction of rotation for each tool...in fraction of a second.

Economical production even on runs of 20 pieces or less.

Quick, easy changeover from automatic to manual operation—without resetting automatic controls. Under manual control, speed and feed for next operation can be preselected while one operation is in progress.

Turret can be swung around on its own axis for facing, forming, plunge cutting and cutoff operations.

Tolerances within ± .0004" to ± .0008" on production runs.

Easy maintenance...gears and hydraulics can be moved out of machine as a unit and be replaced in 15 minutes. Extra gear boxes carried in stock in Cleveland.

Yes, the Gildematik is an amazing machine. Those who saw it—and bought it—at the Tool Show all agree. So will you when this high-speed performer goes to work in your plant. Don't delay getting the whole Gildematik story—write today.

The Special Screw Products Co. bought a Gildematik on sight and got these results:

Says Mr. D. M. Douglas, Plant Manager:

1 SET-UP INSTEAD OF 2

"Machining male and female pipe tees and ells from stainless steel forgings required two set-ups on a conventional turret lathe. With the 16 tool positions on the Gildematik we turn out finished fittings with *one* set-up."

ELIMINATED SECOND OPERATION

"Machining the recess on another part after drilling and tapping previously called for a second operation. With the duplicating attachments on the Gildematik, we machine the recess with a point turning tool, without chatter, and eliminate the second operation."

Engineered servicing from Orban Service Centers in Cleveland, Detroit, Newark. Prompt delivery of stock parts from Cleveland.

KO CO. INC. INDUSTRIAL IMPORTERS

KURT ORBAN COMPANY, INC.

205 East 42nd St., New York 17 • 4220 Prospect Ave., Cleveland 3 • 19450 James Couzens Highway, Detroit 35
1939 Santa Fe Ave., Los Angeles

National Tool Co.

● **Years of successful experience in *special* tooling and related production problems are yours for the asking. When the job requires *special* cutting tools call in your National Tool Co. representative. He is backed by more than 46 years experience in the engineering and manufacture of *special* cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.**

Since 1905 **engineers and manufacturers of high-quality special cutting tools for the metal-working industry**

National Tools Cleveland

National
TOOL CO.
Cleveland 2, Ohio

THEY CAN TAKE IT...and DO!
...and still maintain accuracy

STANDARD *Dial Indicators*

Built to stand the knocks—often unavoidable

NEW - with Years of Service Ahead

REGULAR AGD SERIES

AGD SPECIFICATIONS THROUGHOUT

Made in 22 models including 4 dial diameters, 7 different graduations. Also 90° models (stem perpendicular to back). Long Range and Long Stem types.

Decimatic SERIES

AGD SPECIFICATIONS except Range and Marking

For especially fine checking, extra high repeatability and accuracy. Marked in decimals. No whip of hand. 16 models.

This One Was New...

Years Ago -

Still Serviceable

Obviously it has withstood hard usage, yet indicators such as these are constantly being reconditioned (at a fraction of the original cost) — to return still more dependable service to the owner.

You wouldn't treat your watch the way some indicators have to be treated. Standard Dial Indicators are built to give continuing accuracy while standing the knocks.

Outstanding Reason for the Durability Built into Standard Indicators is the

SHOCKPROOF MECHANISM

Proved by experience to prolong instrument life greatly, Standard's Shockproof Mechanism protects internal parts right from the spindle on. Furnished regularly in most models, not treated as an optional extra. Standard Indicators give longer, trouble-free life, need fewer repairs, are dependable. These facts add up to "Greater Economy."

STANDARD GAGE CO., Inc., *Poughkeepsie, N.Y.*

Don't let our name confuse you!

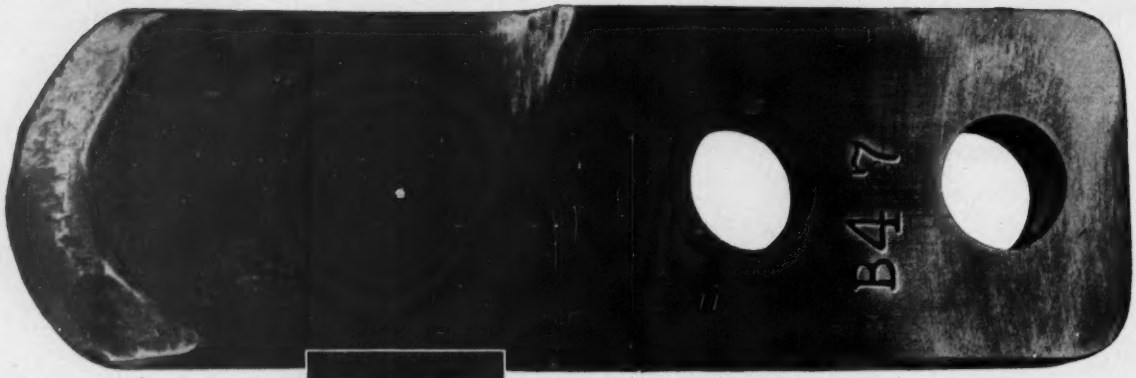
While we've been known as Automotive Gear Works for almost forty years, we have grown steadily in our volume of gears produced for a wide variety of general industrial uses. As a result, more than half of our current production serves industries other than automotive. Whatever your product, where you need gears of the types in which we specialize, call Automotive Gear Works. Write for our new gear handbook containing full information.

AUTOMOTIVE GEAR WORKS, INC.

RICHMOND, INDIANA

DOUBLE DIAMOND GEARS

FOR FARM EQUIPMENT, AUTOMOTIVE & GENERAL INDUSTRIAL APPLICATIONS



This punch gave double service!

B-47 HOT WORK STEEL

gives you more runs for your money

. . . anywhere from 1½ to 5 times the Performance!

This block had double life!

This die lasted 50% longer!

SOME TYPICAL EXAMPLES

B-47 dummy blocks, vs. 9% and 12% tungsten types, extruded more than twice as many brass and copper tubes. B-47 dies outperformed 12% tungsten type 1⅓ to 1.

B-47 punches, vs. low-carbon 18-4-1 type, hot pierced more than twice as many eyes in steel axes. See top picture.

B-47 die inserts, vs. 9% tungsten types, hot pressed more than twice as many steel side gear forgings. B-47 die inserts, vs. regular insert material, performed better than 5 to 1.

B-47 dummy blocks, vs. 5% tungsten-5% chromium types, extruded twice as many copper and brass tubes and rods. B-47 dies outperformed 12% tungsten-12% chromium type.

B-47 punches, vs. 5% chromium type, hot extrusion forged 1½ times as many automotive steel front axle spindles.

B-47 die inserts, vs. 9% tungsten types, extruded 1½ times as many high alloy steel automotive valves. This is considered a very difficult job for any grade of hot work steel.

SEND NOW

for "Blue Sheet" on Grade B-47

This four-page folder gives technical data on B-47 for brass extrusion dummy block and dies, valve extrusion die inserts, hot punch tools, forging die inserts, press forging dies, and hot work in general. *Write for your copy today.*

ADDRESS DEPT. M-38

Looking for a better hot work steel? You'll find it in B-47—an improved chromium, tungsten, cobalt, vanadium type whose superiority is established by actual performance runs such as those summarized above. All tests show that B-47 has unusual resistance to shock and abrasion at elevated temperatures.

Developed originally for applications in the copper and brass industry, B-47 has given excellent results on difficult hot work jobs on steel. B-47, when properly heat treated, exhibits a well rounded combination of red hardness, toughness, and resistance to wear and heat checking that makes it a valuable addition to the Allegheny Ludlum group of hot die steels.

Put B-47 to the test. You'll find that it will do any number of severe hot work jobs without washing out or changing size. Get in touch with A-L, today. Let us help you to use B-47.

● *Allegheny Ludlum Steel Corporation, Henry W. Oliver Bldg., Pittsburgh 22, Pa.*

For complete MODERN Tooling, call

Allegheny Ludlum

AL FINE TOOL STEELS SINCE 1854

WAD 3530

. . . what the President of Taft-Peirce says about Equipment Replacement

"For more than a quarter of a century, The Taft-Peirce Manufacturing Company has rigidly followed a systematic program of machinery and equipment replacement. Instituted first in 1926, our program was predicated on three fundamental principles: (a) the expenditure each year on new equipment of an amount not less than the annual depreciation taken for that year; (b) the strict observance of this procedure, year in and year out, regardless of the business weather; (c) the expenditure, *in addition to this*, in normally good years of a substantial appropriation from earnings.

"Too few concerns recognize the fact that they have in their annual depreciation allowances, under the federal tax laws, a continuous source of funds for equipment replacement. However, in a period of gradual inflation, such as we have experienced for several decades, the depreciation fund alone will not suffice to maintain the plant at physical par. That is why it is vital to plough back into plant some of your earnings.

"We are completely convinced that our program has paid dividends over the years. Indeed, it is the only way we know of being sure that our plant will always be abreast of the times."

Frederick S. Blackall, Jr.
PRESIDENT & TREASURER
The Taft-Peirce Manufacturing Co.

President (1952), National Machine Tool Builders' Association
President (1953), American Society of Mechanical Engineers

ROCKFORD
INSERT
GROUP

Keep Gathering Metal-Working Production Ideas...Be Well Informed When The Time For Replacement Arrives . . . . . .

February, 1953

Get Help on *Any* **PROBLEM RELATED TO HONED SURFACES**

WITH **BARNESDRIL** COMPLETE HONING SERVICE

ENGINEERING • TOOLS • MACHINES • ABRASIVES

BARNESDRIL

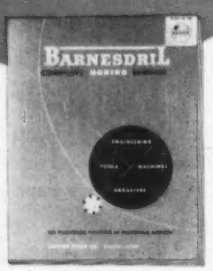
HONING TOOLS

- Use a variety of abrasive stones.
- Available for new machines or machines in the field.
- Serviced by special abrasive experts.
- Replacement stones for all types.

BARNESDRIL

AUTOMATIC BORE-TO-BORE SIZING

BARNESDRIL tool design and development has produced Automatic Bore-To-Bore sizing. The most accurate sizing method yet introduced. The entire sizing operation is now simplified and divorced from the effects of eccentric or uneven stone wear.



Write for bulletin "Complete Honing Service" sent free upon receipt of letterhead request.

BARNESDRIL

ENGINEERING AND MACHINES

BARNESDRIL Engineers have the distinction of first introducing the honing process as a mass production method with the first honing machine built in 1924. They have since developed honing techniques and equipment for both horizontal and vertical applications in finishing automotive and farm implement parts, hydraulic cylinders, gun barrels and recoil mechanisms. With this background of experience and development of a complete line of honing equipment **BARNESDRIL** Engineers assure you of consistent trouble free production in any phase of honing cylindrical surfaces.

ENGINEERING • TOOLS • MACHINES • ABRASIVES

Get in Touch with Your **BARNESDRIL** Representative Today. Ask Him for a Proposal on Your Honing Requirements. Or Write

HOLE **BARNESDRIL** FINISHING

BARNES DRILL CO.

820 CHESTNUT STREET • ROCKFORD, ILLINOIS

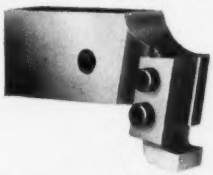
MADE IN **ROCKFORD**... TESTED ENGINEERING AND CRAFTSMANSHIP

ILLINOIS, U.S.A.

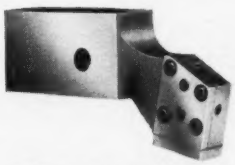
Machinery, February, 1951

GREENLEE *Automatics*

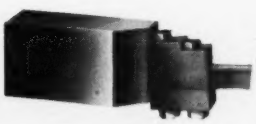
Circular Form-Tool Holder



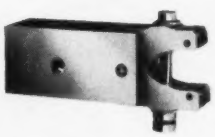
Dovetail Form-Tool Holder



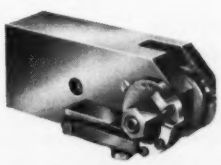
Bit-Type Form-Tool Holder



Cut-Off Tool Holder

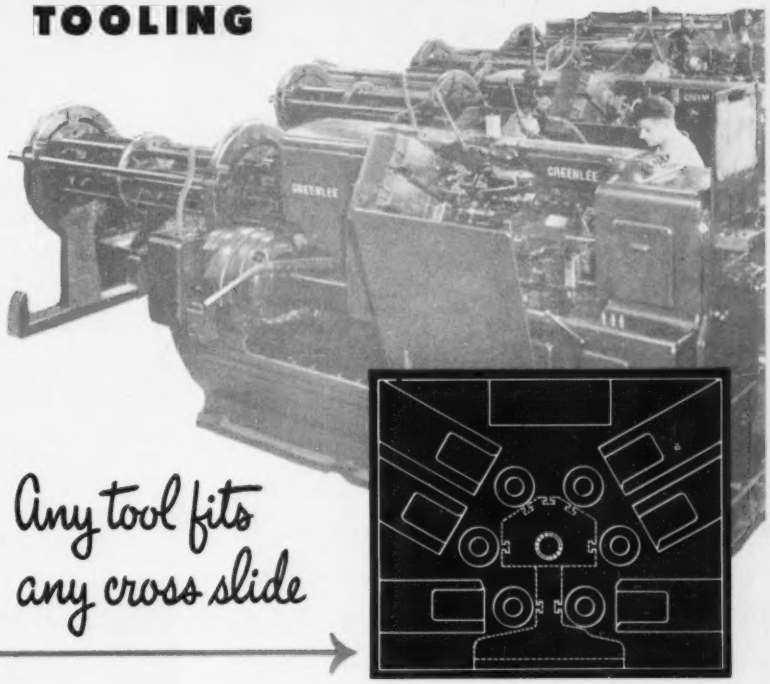


Knurling Tool Holder



Stencilling Wheel Holder

INTERCHANGEABLE TOOLING



Any tool fits any cross slide

SAVE TIME AND MONEY REDUCE JOB COSTS

Among the cost-saving features of Greenlee Automatics, one of the most advantageous is the arrangement whereby *any* of various standardized tool holders will fit in *any* of the six cross-slides. This means not only no limitations as to what tools can be used in which positions, but also a minimum requirement for investment in tools, and a maximum of speed in tool setting when changing over between jobs. *You can profit* from this and the many other outstanding features of Greenlee Automatics.

Write for FREE Literature

Send today for your copy of our 20-page booklet describing and illustrating all the Greenlee features.

PRODUCTION MACHINERY
GREENLEE

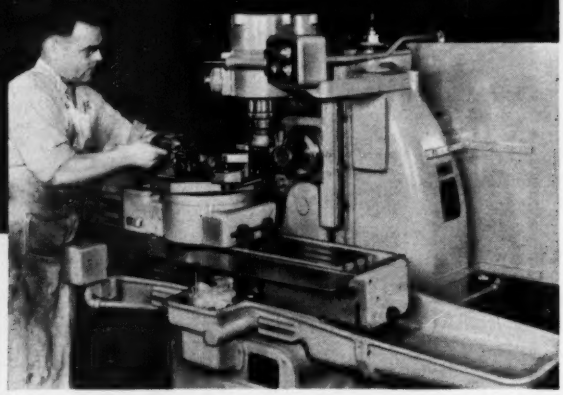
GREENLEE BROS. & CO.
1862 MASON AVE., ROCKFORD, ILL.

MADE IN
FOR PRODUCTION MACHINE TOOLS IT'S...**ROCKFORD**
ILLINOIS, U.S.A.

Here's what can be done with Standard Rigidmils...

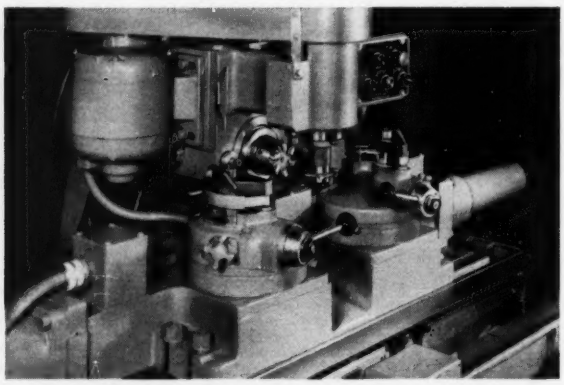
TO SOLVE SPECIAL MILLING PROBLEMS

On standard Sundstrand Rigidmils, the head is a self-contained unit which can easily be replaced with a special head. Consequently, when production or work requirements permit machining several surfaces simultaneously, the standard head can be replaced with a special head, and a *special* job done with the lowest possible capital investment. Furthermore, putting into effect product changes (a difficult problem for many production engineers) doesn't worry anybody in plants where Rigidmils are installed. As these machines can be converted so readily to meet production changes, they represent a combination of maximum production with minimum capital investment. Here are six good examples of standard Rigidmils "engineered" to a production job with "only the head as special".



Special 2-Spindle Head Mills Top and Side of Part Simultaneously

This standard Sundstrand Rigidmil has a special head with one vertical and one horizontal spindle for milling two surfaces of refrigerator cylinders in one automatic cycle. Additional production is obtained by the two indexing fixtures, which permit loading of one part during the milling of another. Production is 150 parts per hour.



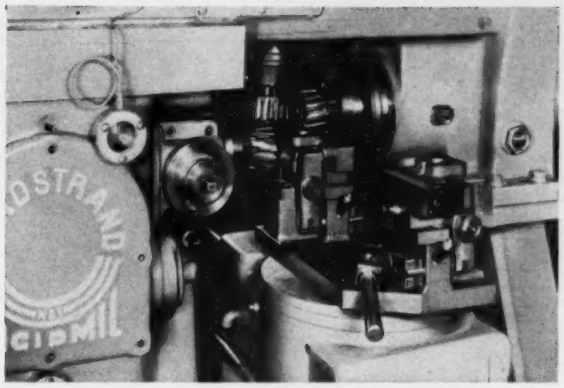
Face Milling and Slotting With Special 2-Spindle Head

This Sundstrand Rigidmil is provided with a special high speed head equipped with one vertical and one horizontal spindle. Each spindle has endwise adjustment, and horizontal spindle is provided with automatic retraction. Two power-operated rotary tables are timed and interlocked with the automatic table cycle for rotary milling of the face and slot in washing machine brake shoes. Manually clamped fixtures hold the part for a cycle of load and unload at one end while milling at opposite end. Production is approximately 145 per hour.

SUNDSTRAND

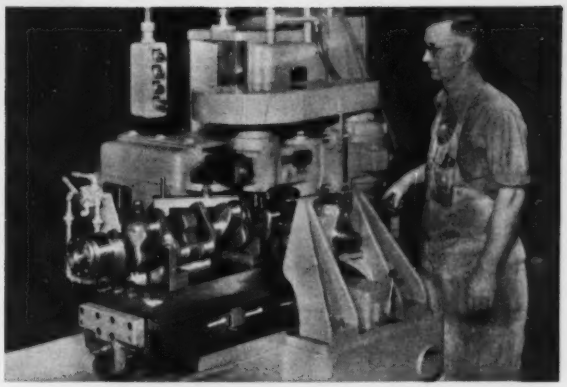
RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

MADE IN ROCKFORD...FOR ACCURATE, FAST METAL REMOVAL ILLINOIS, U.S.A.



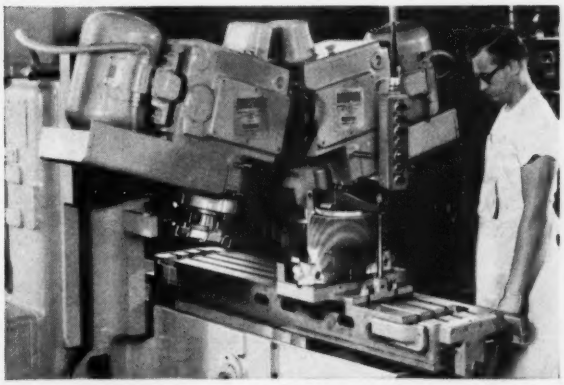
Three Sides of Part Milled Simultaneously With Special 3-Spindle Head

The standard Rigidmil above has a special head with one vertical spindle and two opposed horizontal spindles offset vertically. The top and both sides are milled in one automatic cycle. Not only are operations saved, but the three surfaces are held in accurate relation to each other. Again, automatic indexing of fixtures provides free loading time and helps obtain the production of 172 pieces per hour.



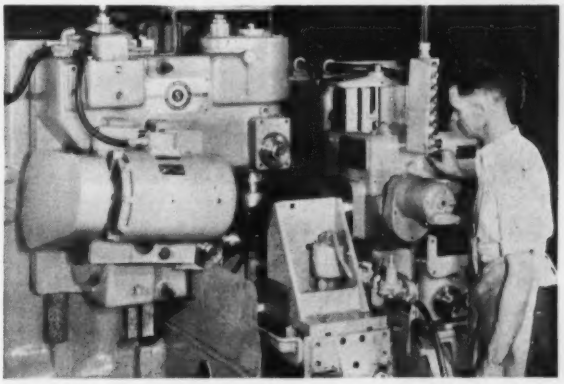
Straight and Woodruff Keyways Milled With Special 2-Spindle Head

Here's a standard Sundstrand Rigidmil "tooled" for a special keyway milling job. It is provided with a regular horizontal spindle head for milling a straight keyway and an attached pivoting head for milling a Woodruff keyway. Both keyways are located in one end of the crankshaft and both are milled simultaneously. Keyways are held in definite relation to each other by milling both in same setting of crankshaft.



Duplex Rigidmil Has Two Special Heads for Angular Milling Operations

This Sundstrand Duplex Rigidmil is equipped with two special heads for angular milling on aircraft cylinder heads. With workpiece inverted in fixture, the milling heads, one set at 10° and the other set at 15°, mill both rocker bosses simultaneously. The machine operating in automatic table cycle of rapid approach, feed and rapid return completes 64 cylinder heads per hour.

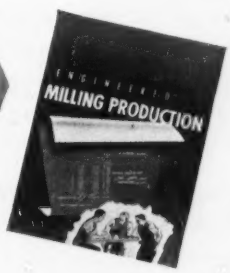


Duplex With One Special 2-Spindle Head Mills 3 Surfaces Simultaneously

A special two-spindle head is mounted on the left hand column of this standard Sundstrand Duplex Rigidmil. One is a vertical spindle and the other is set at 5° from horizontal. The right hand column carries a standard horizontal head. Pads on both sides and top of transmission cases are milled in automatic cycle at the rate of 67 pieces per hour.

Free Data

Write for more proof of the successful application of Sundstrand "Engineered" milling production. This new 40 page book contains over 35 actual problem solutions together with interesting tooling diagrams. Write for your copy today. Ask for Bulletin No. 628.



SUNDSTRAND

SUNDSTRAND
Machine Tool Company
2530 Eleventh St. Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

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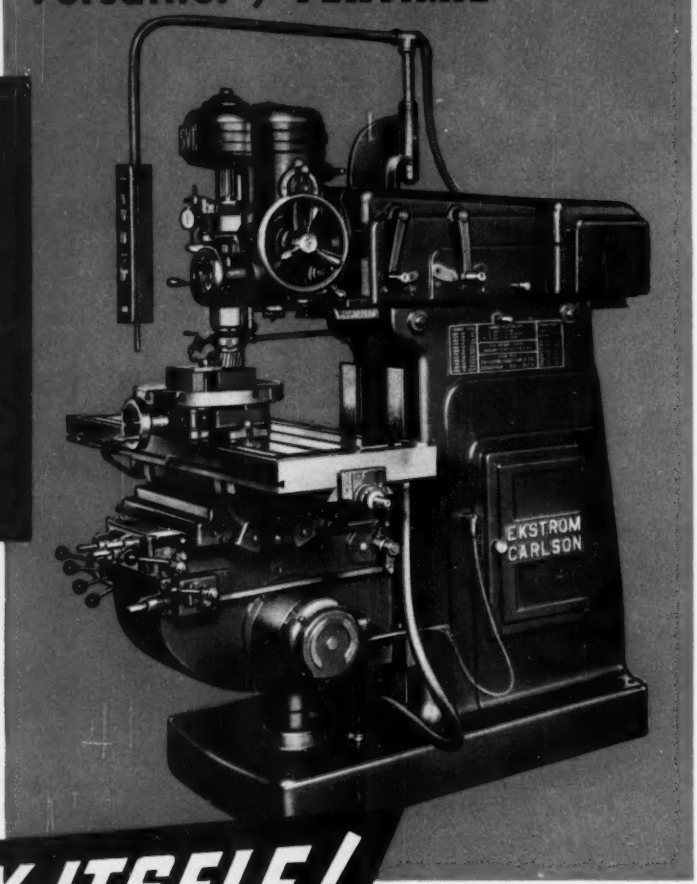
YOU'LL FIND YOUR PRODUCTION MACHINE TOOLS IN...ROCKFORD
ILLINOIS, U.S.A.

EKSTROM, CARLSON

No. 5V (for "Versatile!") VERTIMIL



POWER CROSS FEED

POWER VERTICAL FEED
(SPINDLE AND KNEE)

POWER LONGITUDINAL FEED

TILTING TABLE

TILTING SPINDLE

IN A CLASS BY ITSELF!

Write for full details Bulletin 5-V

EKSTROM, CARLSON & CO.
1400 Railroad Ave.
Dept. M-4
Rockford, Ill.

ECCO

Yes, for all types of toolroom work and many kinds of production work, this machine is *hard to beat!* Ekstrom, Carlson engineers have built into this *one* sturdy machine features which make possible the machining of *compound angles* without shifting the work and without special tooling. The machine also is excellent for precision boring, drilling, and milling.

Rapid traverse, broad spindle speed range, spindle motors up to 25 hp, and centralized controls — all add up to more work at less cost. Investigate today!

MANUFACTURERS OF MACHINERY AND TOOLS SINCE 1904

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ROCKFORD...MACHINE TOOL SHOPPING CENTER
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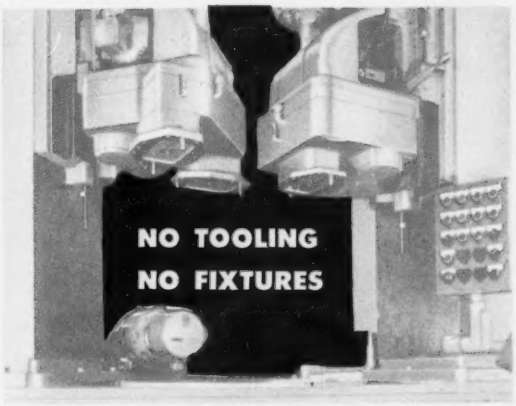
Rehnberg-Jacobson

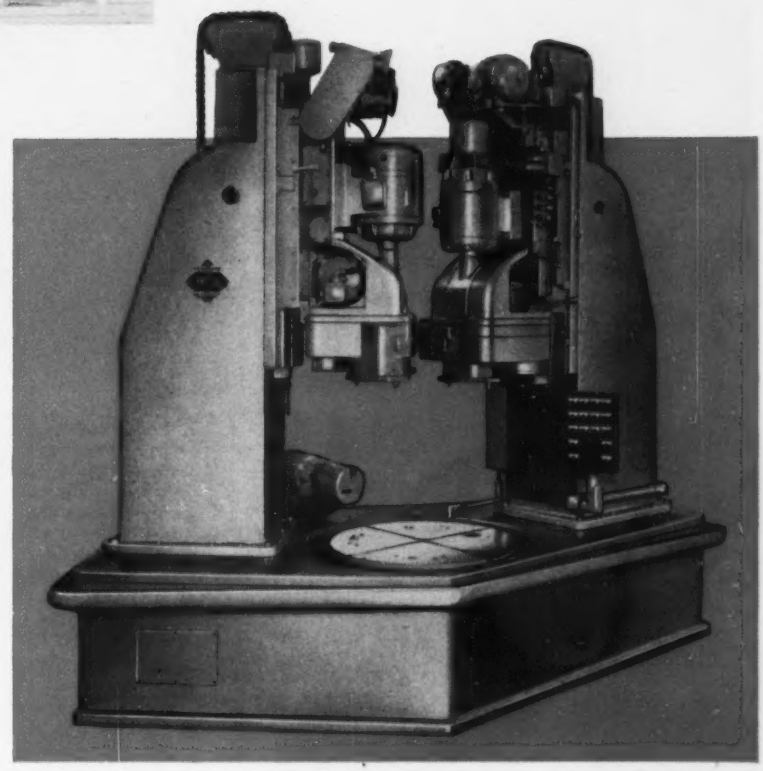
GENERAL-PURPOSE "SPECIAL" MACHINES



This machine was ordered as you see it—"barefooted", without tooling or fixtures. It is a special machine, built to order with a specified combination of standardized units on an uncomplicated structure. Yet the purchaser can use it in a number of ways. He can arrange it for one, two, or three drilling positions and one loading, or he can perform tapping operations in the third position. He can use single or multiple-spindle heads. He can arrange work-holding fixtures any way he wants to on the index unit. In other words, he has a very versatile "special" machine that can be quickly adapted to a lot of production jobs, instead of being limited to one.

R-J UNITS CAN BE USED IN MANY WAYS TO MAKE MACHINES LIKE THIS . . .

There is almost no limit to the variety of ways in which the principle of this machine can be adapted to different purposes. For example, if you have in mind a string of different sizes for a new product, you can have us make you a machine on which you can interchange heads and fixtures to handle each size in turn as the lots go through your shop. You are not limited to vertical machines only — we have a number of basic horizontal arrangements that are equally flexible. Nor are you limited in the number of heads, their respective positions, or the number of indexes on the table. Just as an example of adaptability, one of the units on the machine shown here can be changed over from a tapping unit to a drilling unit simply by throwing a single lever. We suggest you tell us some of your coming production problems — and let us see if we can furnish something like this machine to solve them economically.



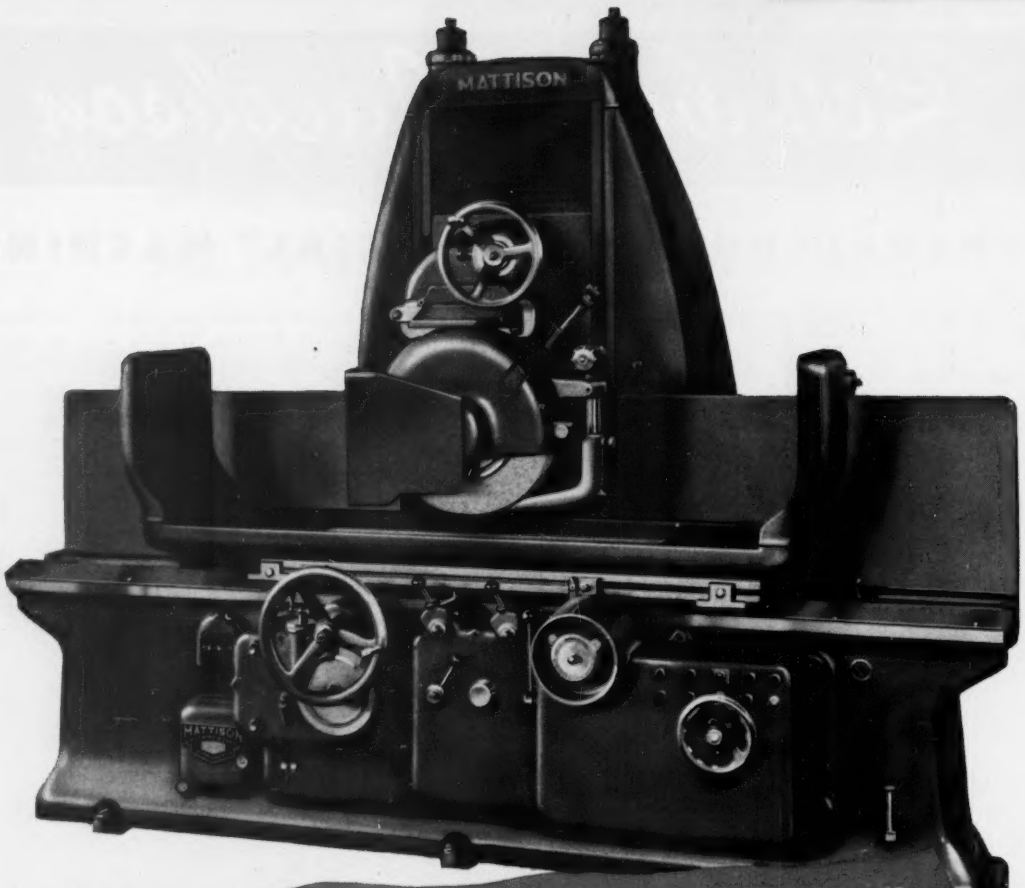
REHNBERG-JACOBSON MFG. COMPANY

DESIGNERS & BUILDERS OF SPECIAL MACHINERY

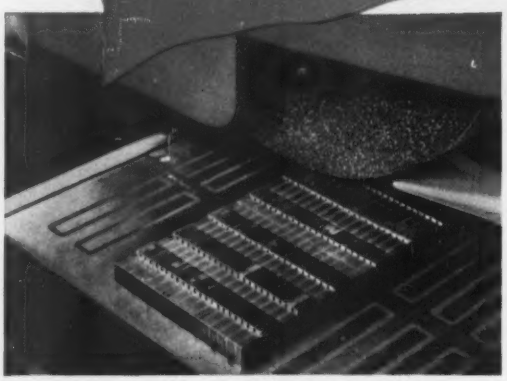
R-J

2135 KISHWAUKEE ST.
ROCKFORD, ILLINOIS

MADE IN
ROCKFORD MADE MEANS PRECISION MADE...ROCKFORD
ILLINOIS, U.S.A.



HERE'S A CHANGE THAT INCREASED PRODUCTION FROM 30 PER HOUR TO 200 PER HOUR



Both sides of type-stamps are now ground 200 per hour on a Mattison Grinder. Previous production—30 per hour.

● Because of the greater load and grinding area of their Mattison High Powered Precision Surface Grinder, Geo. T. Schmidt, Inc., Chicago, Illinois have been able to effect considerable savings in grinding time over their previous method. As an example—the type stamps shown in the picture above were formerly ground a few pieces at a time on a small grinder—30 per hour. The Mattison Grinder they are now using provides larger table space and a larger grinding wheel together with the necessary power and stability to permit the grinding of more pieces per load at a production rate of 200 per hour. Similar results are obtained on other parts.

Mattison High Powered Precision Surface Grinders have the high power and rugged double-column construction for rapid stock removal and the precision necessary for high quality finish and accuracy to close limits.

This combination not only will enable you to step up production on small parts, but permits grinding large work which previously could not be handled. For further information send for free circular.

MATTISON MACHINE WORKS

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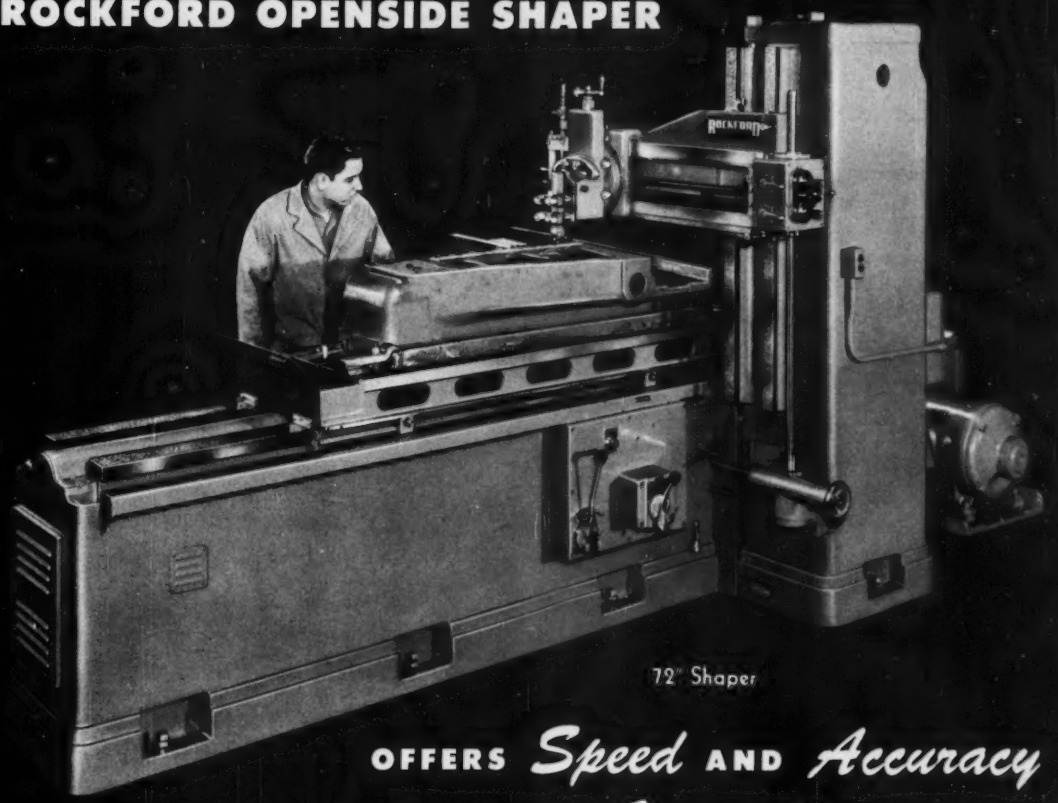
ROCKFORD...A CONVENIENT SOURCE FOR PRODUCTION NEEDS

ILLINOIS, U.S.A.

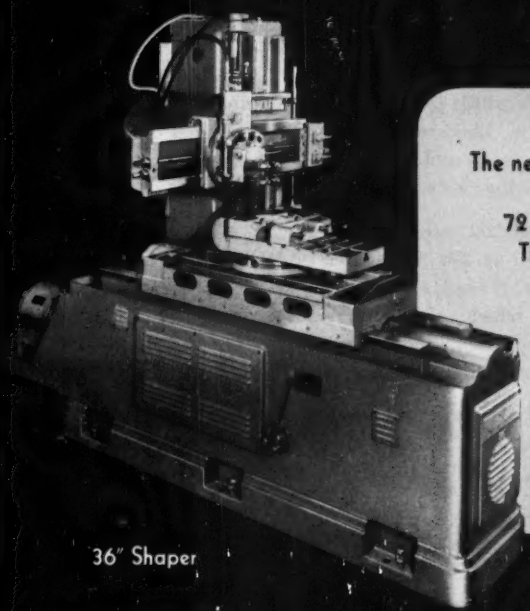
NEW.....

ROCKFORD OPENSIDE SHAPER



72" Shaper

OFFERS *Speed* AND *Accuracy* PLUS *Versatility*



36" Shaper

The new 72" Rockford Openside Shaper gives you *best* results on *all* shaper jobs — with stroke lengths up to 72 inches.

This "big brother" of the Rockford Openside Shaper family (36", 48", 60", 72") has all the superior features of companion models, *plus* increased capacity. It's the maximum in versatility — large-job capacity with no sacrifice in speed or accuracy. And it's *Hydraulic* . . . of course.

Before you invest, investigate the new 72" Rockford Openside.

Hy-Draulic

ROCKFORD MACHINE TOOL CO.

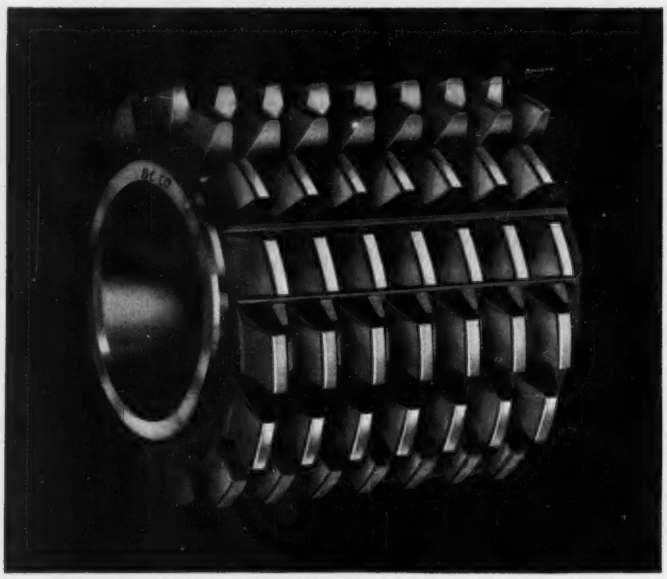
2500 Kishwaukee Street • Rockford, Illinois

MADE IN

CENTER OF MACHINE TOOL EXCELLENCE...ROCKFORD

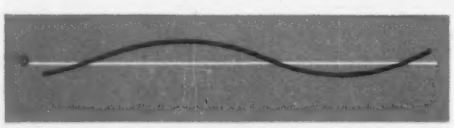
ILLINOIS, U.S.A.

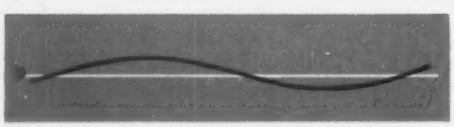
CLASS AA HOBS
FOR THE FINEST IN GEAR ACCURACY



CONTROL LIMITS WITHIN CLOSE RANGE

Although the hob is not the only factor affecting the accuracy of gears, it does have an important effect, particularly upon the profile of the gear. Barber-Colman makes hobs to all the standard tolerances to satisfy any of your gear requirements.





In addition to the standard classes, Barber-Colman has developed the Class AA hob which is made to consistently closer tolerances than any other hobs. This class of hob has proved itself in actual production for many years and is recommended for the utmost in accuracy if other conditions warrant the use of such a fine tool.

Within established standard hob tolerances, some hobs naturally approach high or low limits to a greater degree than others. On certain classes of work, it may be necessary to select from your tool crib the hobs which cut the most accurate gears. In such cases when you require hobs of the finest and most consistent accuracy, we suggest your consideration of Class AA hobs.

In many cases, your gear requirements may not demand this degree of precision control. But whatever your hobbing problems may be, Barber-Colman Engineers will be glad to help you solve them.

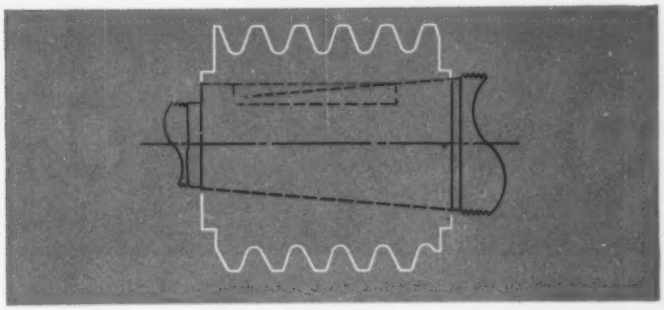
DESIGNERS OF STANDARD AND SPECIAL

MADE IN
ROCKFORD...CITY OF MACHINE TOOL SPECIALISTS
ILLINOIS, U.S.A.

TAPER HOLE HOBS AID ACCURACY CONTROL

Runout can destroy most of the inherent accuracy of a hob. As a further step in accuracy control, Barber-Colman Hob Engineers have developed hobs with taper bores. They are recommended for all Class AA Hobs, and for all hobbing jobs where accuracy is paramount.

Where high accuracy requirements are demanded it is much easier to true hobs with the taper bore mounting. Compared with the sliding contact on straight hole hobs, the taper provides metal-to-metal contact, eliminating the possibility of an increase in runout during the cutting operation. Also, much time is saved by the operator because the hob will run as true as the spindle.



TAPER BORES PROVIDE TRUE CENTERING ACTION

Production-line accuracy in all metal cutting operations is constantly approaching closer limits. Gear hobbing is perhaps the outstanding example. When you have gear tooth problems be sure to ask Barber-Colman Hobbing Engineers to work with you. One of the longest experiences in gear cutting is available to you without cost or obligation.

Write for a copy of Hobbing Notes — "Hobbing Accurate Gears"

HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES

BARBER COLMAN

Barber-Colman Company

GENERAL OFFICES AND PLANT, 721 ROCK STREET, ROCKFORD, ILLINOIS, U.S.A.

METAL CUTTING TOOLS SINCE 1908

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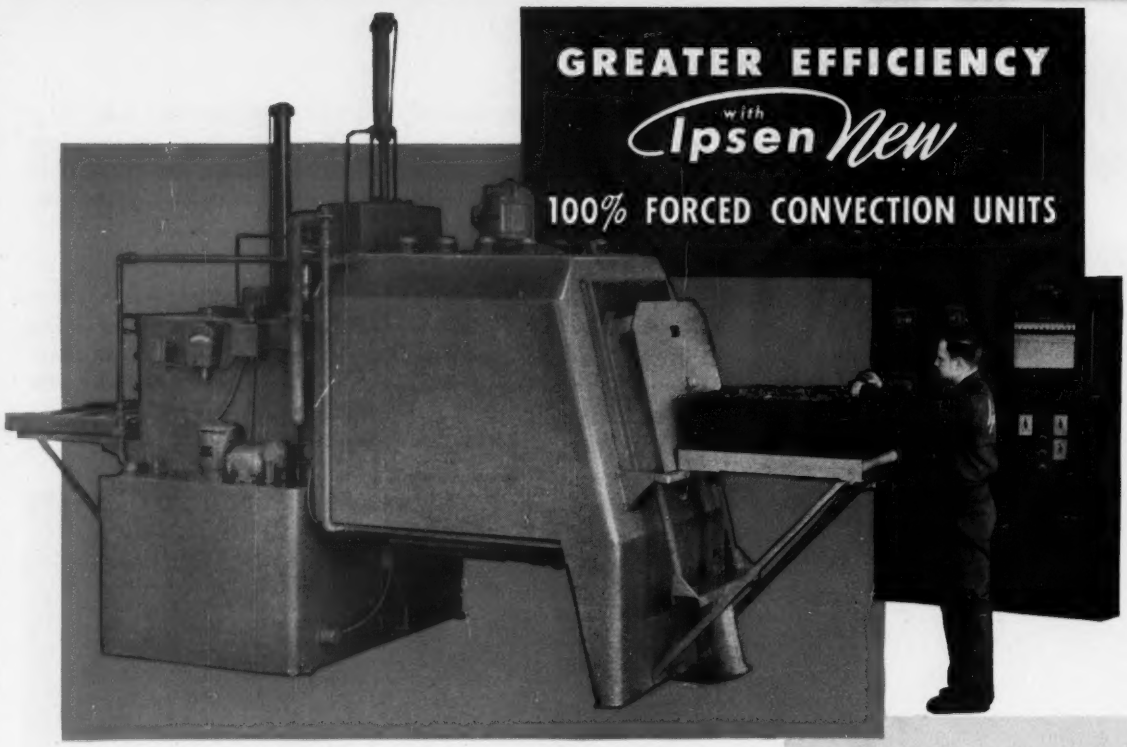
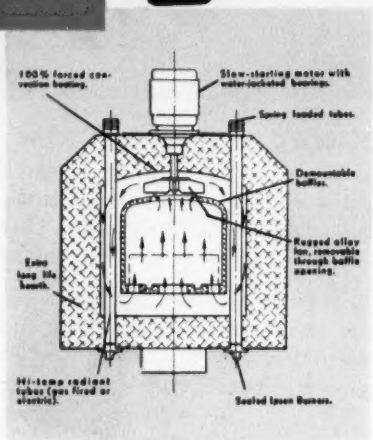
GREATER EFFICIENCY with Ipsen New 100% FORCED CONVECTION UNITS



▲ *New Ipsen 400 Lb./Hr. Automatic Heat Treating Unit equipped for martempering. Straight-through operation from heat through quench, or cooling, eliminates loading delays.*

▶ *Ipsen's new radiant tube and 100% forced convection heating design. Spring-loaded tubes seal automatically. Controlled atmosphere throughout assures bright, clean, scale-free work.*


100% forced convection heating.
Slow-starting motor with water-jacketed bearings.
Spring loaded tubes.
Demountable baffles.
Rugged alloy fan, removable through baffle opening.
Extra long life hearth.
Hi-temp radiant tubes (gas fired or electric).
Sealed Ipsen Burners.

Ipsen controlled atmosphere heat treating units are designed with 100% forced convection heating to provide greater efficiency. Built for temperatures up to 1850° F., they can profitably handle a wide range of work, both in small lots and in production runs.

These are some of Ipsen's outstanding design features which will give you greater efficiency in processing:

1 **100% Forced Convection Heating**—powerful alloy fan forces atmosphere around radiant tubes, under floor, and *through* the work. Provides faster heat recovery and uniform circulation. Fan is removable through baffle opening in hearth.

2 **Long Life, Radiant Tubes** — withstand high temperatures, assure long, trouble-free service. Light in weight, are easier to remove, cost 50% less to replace.

3 **New Sealed-in Silent Burners**—provide accurate flame control, fast temperature buildup, *complete* combustion and uniform temperature.

4 **Demountable Baffles** — assure complete circulation of atmospheres through the load and maintain uniform work temperature. Sectional-type construction permits easy replacement. Complete unit can be removed in ten minutes.

Send **Samples for Free Estimate** — find out how the new Ipsen Units can be applied to your job. Samples of your work will be run, procedures established in our new, modern lab, and cost estimates given without obligation.

Write **for New Literature** — illustrates new design features, gives complete specifications of various units.

AUTOMATIC **Ipsen** HEAT TREATING UNITS

IPSEN INDUSTRIES, INC. 717 South Main Street; Rockford, Illinois

Universal Units for CARBONITRIDING • CARBURIZING • HARDENING • BRAZING • MARTEMPERING

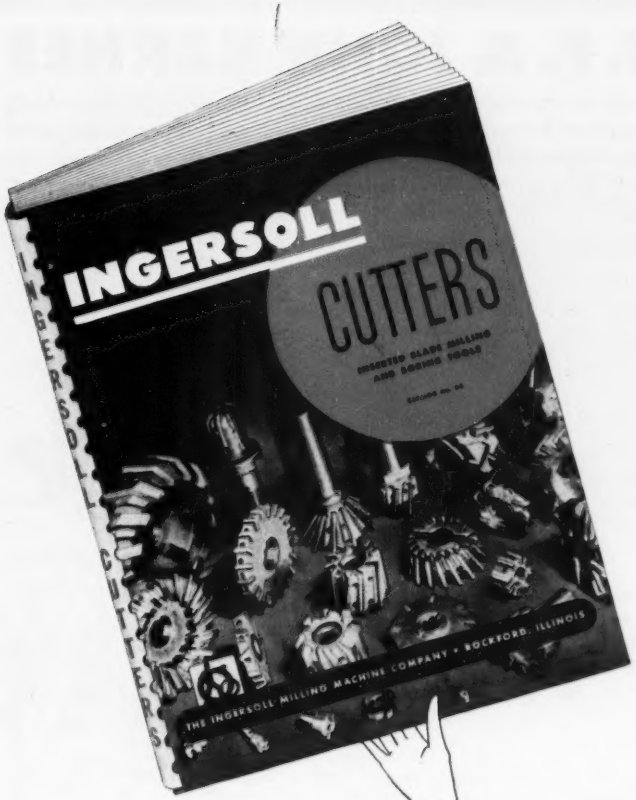
MADE IN ROCKFORD... FOR MACHINES DESIGNED TO SUIT YOUR PRODUCTION

ILLINOIS, U.S.A.

INGERSOLL'S *New*

CUTTER CATALOG

INSERTED BLADE MILLING AND BORING TOOLS



Important recent advances in tool design have made necessary a complete revision of the Ingersoll cutter catalog. The 1953 edition includes extensive material on carbide milling of steel, as well as new information on the proper selection of tools, cutting methods, and cutter grinds for all kinds of work.

Ingersoll cutter designs are constantly being improved to meet requirements of the heavier, faster acting, more powerful machine tools being built today. The knowledge we gain in designing Ingersoll production equipment for a wide variety of work enables us to recommend the proper cutters for all types of machines and materials.

GET YOUR COPY NOW!

WRITE FOR CUTTER CATALOG 60B

THE INGERSOLL MILLING MACHINE CO. **ROCKFORD, ILLINOIS**

FOR PRODUCTION MACHINE TOOLS IT'S...ROCKFORD

MADE IN ILLINOIS, U.S.A.

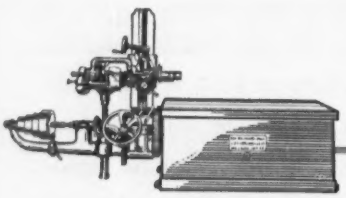
80 YEARS OF PROGRESS

at W. F. & JOHN BARNES

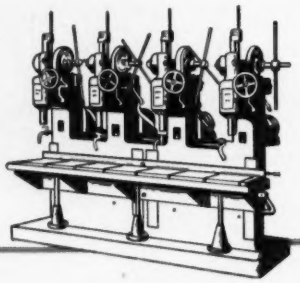
Presented here are a few of the milestones in machine tool building which, over the years, have helped industries achieve the goal of producing more and more goods for more and more people at a lower cost. In effect, the application of these early Barnes Machines trace the technological advancement in machining methods. With this background, we are today better able to serve your current and future needs.

1872 Foot-Powered Scroll Saw — the first Barnes-built industrial machine.

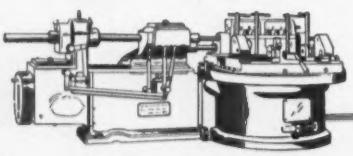
1885 Open Frame Single Spindle Drill Press — belt-driven and hand feed.



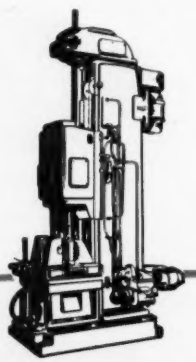
1900 Barnes Horizontal Radial Drill — used for automobile crankcase drilling and boring work.



1920 Single Purpose 20" Barnes Production Gang Driller.



1925 Barnes Single Head Screw Feed Boring Machine — equipped with rotating table.



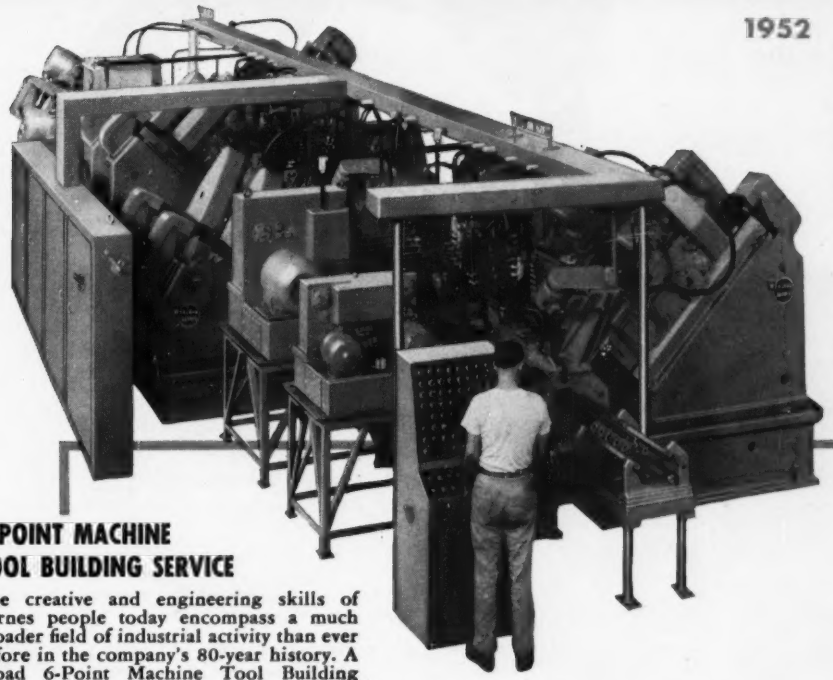
1930 Barnes Special Vertical Single Point Boring and Reaming Machine — equipped with hydraulic feed unit.

W. F. & JOHN BARNES COMPANY

MULTIPLE SPINDLE DRILLING • BORING • TAPPING MACHINES

MADE IN
ROCKFORD...MACHINE TOOL PLANTS CLOSE TO YOUR PLANT
ILLINOIS, U.S.A.

in Machine Tool Building



1952

One of the latest Barnes Automatic 13-Station Progress-Thru Machines for drilling, reaming, chamfering and tapping V-8 automobile engine cylinder heads. Machine is equipped with 82 spindles and handles 78 machining operations at a gross production rate of 125 pieces per hour.

(Below) An Automatic Retort Loading Machine is one of a variety of special equipment, such as glass handling machines, can unloaders, carton uncasers and special conveyors designed and currently built at Barnes for food, chemical and beverage industries.

6-POINT MACHINE TOOL BUILDING SERVICE

The creative and engineering skills of Barnes people today encompass a much broader field of industrial activity than ever before in the company's 80-year history. A broad 6-Point Machine Tool Building Service is provided by experienced mechanical, hydraulic, electrical, process, tool and fixture engineers working together toward a common goal. As a result, you get the benefit of a coordinated effort that saves time and trouble.

BARNES SPECIAL MACHINE TOOL BUILDING SERVICE INCLUDES . . .

1. **SPECIALIZED MANUFACTURING FACILITIES**—80 year background, large well equipped plant efficiently tooled to produce high production machines.
2. **SPECIAL HYDRAULIC EQUIPMENT**—designed and built to meet JIC standards. Individually engineered units assure smooth, dependable actuation for every requirement.
3. **SPECIAL GAUGES, FIXTURES, TOOLS**—designed for each individual machining problem, assure accuracy of operation at high production speeds.
4. **SPECIAL ELECTRICAL EQUIPMENT and CONTROLS**—individually designed and built for maximum safety and ease of control with circuits that assure the most dependable coordination of all machine functions.
5. **SPECIAL HANDLING AND CONVEYOR EQUIPMENT**—designed and built to reduce work handling, effect maximum safety and efficiency.
6. **COORDINATED DESIGN AND ENGINEERING**—Mechanical, Hydraulic, Electrical, Process, Tool, and Fixture Engineers work together at Barnes. Team-work solves complex problems quickly.

Write for Free Data

Ask for free booklet "Coordinated Machine Engineering" describing the scope of Barnes machine tool building service. Illustrates and describes modern machines and mass production techniques.

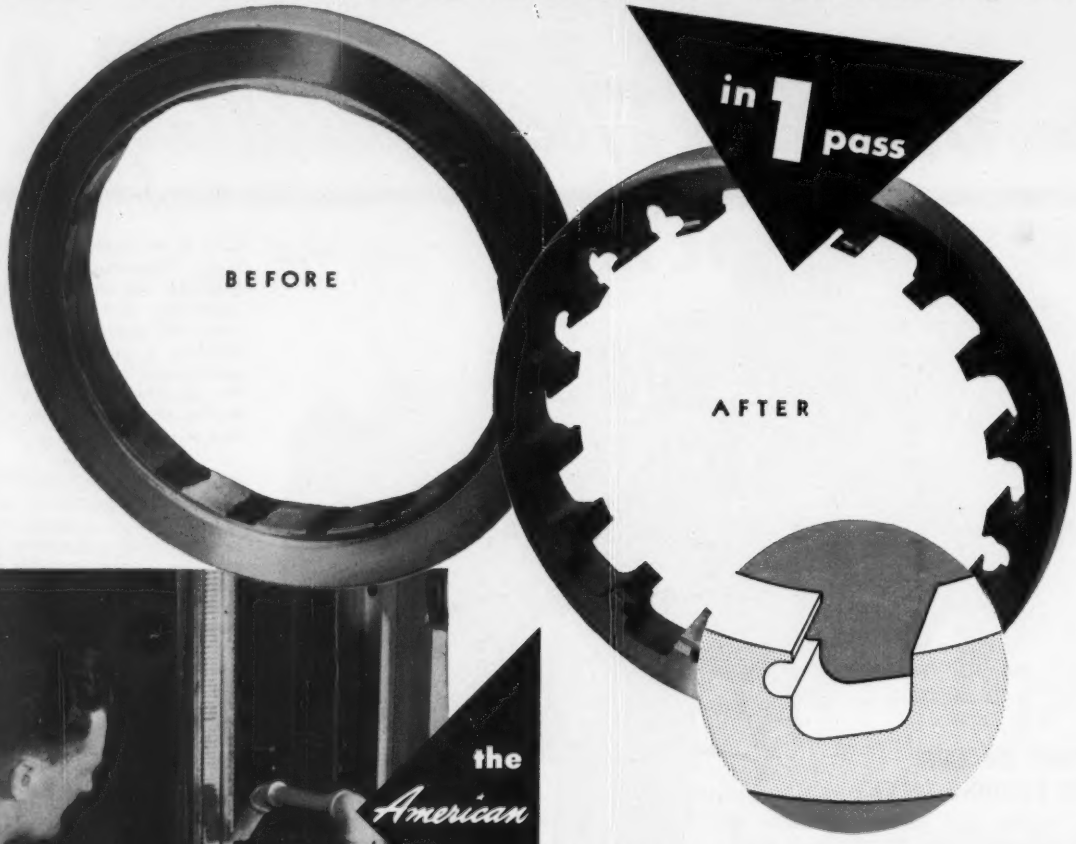
310 S. WATER STREET, ROCKFORD, ILLINOIS

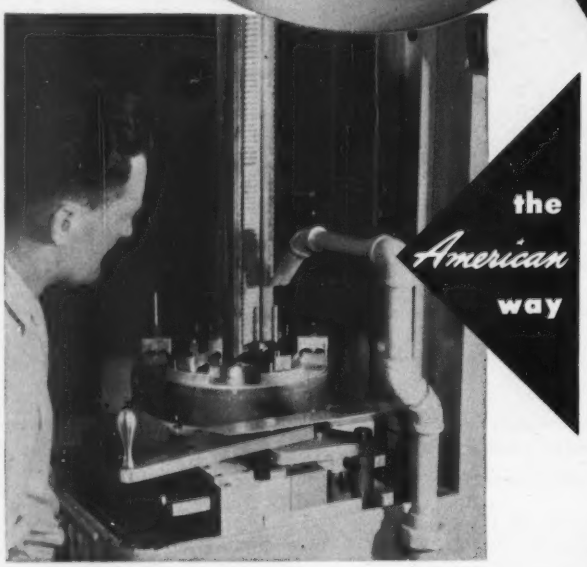
AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES

MADE IN

FOR METAL REMOVAL WITH ACCURACY AND SPEED...ROCKFORD ILLINOIS, U.S.A.

This intricate form broached accurately...





This is only one example of how American designs broaches, machines, and fixtures to save time, labor and machine operation costs. You can get these advantages too, by sending a part-print or sample and hourly requirements to the organization that builds all three . . . broaches, machines and fixtures. Write Dept. M today! No obligation.

An American Vertical Hydraulic 72" stroke machine was equipped with special tooling to broach the 18 slots and adjacent undercuts in a stator ring in 18 passes — these slots being held accurately with respect to form as well as location.

The machine has a hardened and ground broach holder carrying two broach sections which are guided through the fixture base in hardened and ground guides. The manually operated index fixture mounted on a cross slide moves the part in and out of broaching position. This provides clearance for the broach and holder assembly and permits unloading and reloading of the part as well as indexing of the fixture.

The broach inserts mounted side by side rough broach two slots simultaneously and finish respectively a cam surface in one slot and adjacent undercut in the other. 18 slots are broached in 18 passes to complete the operation, the slots being broached to a depth of approximately .500.

Write for circular No. 300

AMERICAN **American BROACH & MACHINE CO.**

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

SUNDSTRAND

See American First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

MADE IN

ROCKFORD...A CONVENIENT SOURCE FOR PRODUCTION NEEDS

ILLINOIS, U.S.A.

Have you tried this acid-detergent method for removing rust and oil at the same time?

Here is what users are saying about Oakite Compound No. 33

MICHIGAN: "Removing rust for less than 9 cents per wheel; sand blasting cost 25 cents."

TEXAS: "Eliminates practically all rejects and also handwiping of booster caps."

NEW YORK: "Have never seen such clean parts with such perfect paint adhesion . . . Putting Oakite Compound No. 33 in specification sheets for sub-contractors on these registers."

ILLINOIS: "Works a miracle taking heavy rust off steel cabinets."

PENNSYLVANIA: "Well pleased with removal of drawing compound, heat scale, rust and oil. Parts coming through good and clean."

CALIFORNIA: "This material is a beauty . . . one we've been waiting for on this jeep overhaul job."

MICHIGAN: "Removes oil, rust and scale faster . . . Increases adherence of rubber to steel for motor mounts and bumpers."

MASSACHUSETTS: "Removed carbonized smut and scale from rocket parts perfectly in 8 minutes."

MISSOURI: "Results very good. All corrosion removed from battery connectors."

OHIO: "Eliminated one wiping operation . . . Paint really sticks on metal caskets."

NEW YORK: "Beautiful job . . . Removes residues from steel transformer cases . . . eliminates one operation. Delighted with saving. . ."

SPECIALIZED INDUSTRIAL CLEANING

OAKITE

MATERIALS • METHODS • SERVICE

Technical Service Representatives Located in Principal Cities of United States and Canada

Metal craftsmen using Oakite Compound No. 33 say it is just what they've been looking for: a metal-cleaner that combines three important operations into one:

1. **It removes rust** *at the same time that*
2. **It removes oil** *at the same time that*
3. **It prepares the metal for painting**

Oakite Compound No. 33 removes rust, heat scale, tarnish, other oxides, stamping and forming oils, rust preventives, carbon smuts, soldering and welding fluxes, identification inks and similar soils. It develops excellent paint adhesion on steel, cast iron, aluminum sheet and castings.

For Use in Tanks or by Hand—Oakite Compound No. 33 is great for soak-cleaning metal parts of moderate size; and great for hand-swabbing on large metal surfaces.

Often Avoids Pickling—Oakite Compound No. 33 removes rust and oil so successfully that it frequently eliminates the need for a cycle of separate cleaning, pickling, neutralizing and paint-conditioning operations. It saves money in many ways.

FREE For a copy of "*New metal cleaner removes oil and rust in one operation*"—describing the use of Oakite Compound No. 33—just drop us a note or mail the coupon.

OAKITE PRODUCTS, INC.
26 Rector St., New York 6, N. Y.

Send me a FREE copy of "*New metal cleaner removes oil and rust in one operation*"
Also, send me information about Oakite methods for the following jobs:

- ☐ Tank cleaning
- ☐ Electrocleaning steel
- ☐ Electrocleaning non-ferrous metals
- ☐ Machine cleaning
- ☐ Pickling
- ☐ Steam-detergent cleaning
- ☐ Pre-paint treatment
- ☐ Paint stripping
- ☐ Burnishing
- ☐ Rust prevention

NAME_____

COMPANY_____

ADDRESS_____

WHICH sleeve bearing would you use?

THERE ARE many things to consider when selecting a Sleeve Bearing. Johnson engineers appraise service conditions carefully: load, shock, speed, temperature, lubrication, corrosive conditions and other service considerations. Based on these studies, they will recommend the Sleeve Bearing to suit the application. Since Johnson Bronze produces bearings from cast bronze, cast aluminum alloy, sheet bronze, bronze on steel, babbitt on steel, babbitt on bronze, powdered metal and graphited bronze, a wide variety of Sleeve Bearings is available, and can be recommended without prejudice to any one type. If you are in doubt about the bearing to specify, ask Johnson Engineers. No obligation. Write today.

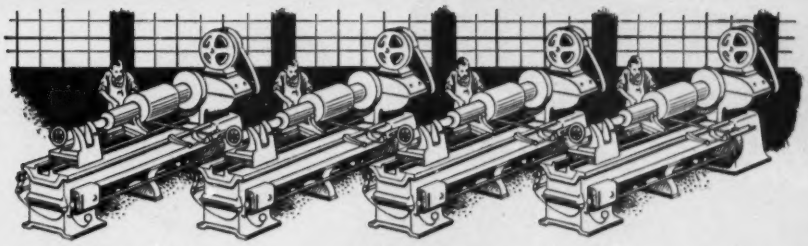
JOHNSON BRONZE COMPANY
520 South Mill St., New Castle, Pa.

JOHNSON JB BEARINGS
Sleeve-Type

SLEEVE BEARING HEADQUARTERS SINCE 1901

Tool Steel Topics

BETHLEHEM STEEL



Output up 150 pct with Red Sabre Bits

Four identical lathes, side by side, produced identical parts in one of our customer's shops. Using both high-speed steel and carbide tool bits, the rate per shift was set at 150 pieces per machine by the time-study engineers.

One of the lathe operators heard about our Red Sabre tool bits from a friend. So he brought one to work and began using it. He surprised himself by finishing 325 pieces in one shift, earning a nice bonus.

When he kept up his high rate, the payroll department began to ask questions. But a check-up showed that the operator's production was being reported correctly. In fact, his output increased to an average of 370 pieces.

When the time-study men got to the bottom of the mystery they really became enthusiastic. Red Sabre bits were installed on all four lathes. Output reached as high as 400 by increasing speeds and feeds.

Red Sabre bits are mighty popular in this shop because both the machine operators and the management are reaping the benefits of the increased output.

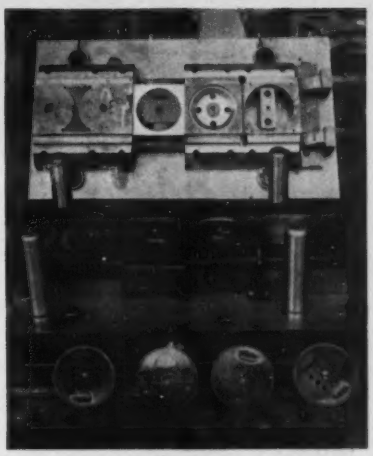
Red Sabre is our super high-speed steel. It has more wear-resistance and higher red-hardness than run-of-the-mill tool bits. Red Sabre tool bits, hardened to a minimum of Rockwell C-65 and ground accurately, are available in all standard sizes.

Like to try them in your shop? Order a couple from us at Bethlehem, Pa., or ask your distributor about a trial.

◀ (Left) A kitchen-ware maker uses BTR* for the die that blanks and draws .032-in. aluminum to accurate size. The fit between the die halves is held to close tolerance to assure proper flow of metal during the one-stroke draw and to produce a smooth surface. This die has produced more than half a million pieces.

(Right) In a single operation these piercing dies, made of our BTR* tool steel, put 125 holes in the aluminum accessory for pressure cookers shown at the right. The punches were in excellent alignment after heat-treatment, and showed little evidence of wear after producing 165,000 pieces without requiring regrinding. ▶

*BTR is an economical, general-purpose tool steel. Oil-hardening, it's easy to machine and heat-treat. Tough and wear-resisting, it's low in distortion.



HIGH-PRODUCTION DIE

This blanking, drawing, and forming die is made of high-carbon, high-chromium tool steel (our Lehigh H) to make possible long production runs. Operated in a 350-ton press, it produces end caps for a refrigeration unit. Hardened to Rockwell C-60, this die turns out about 100,000 pieces from 3/16-in. steel strip before redressing is needed. An air-hardening grade of tool steel, Lehigh H provides very high wear-resistance and the least amount of distortion during heat-treatment.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

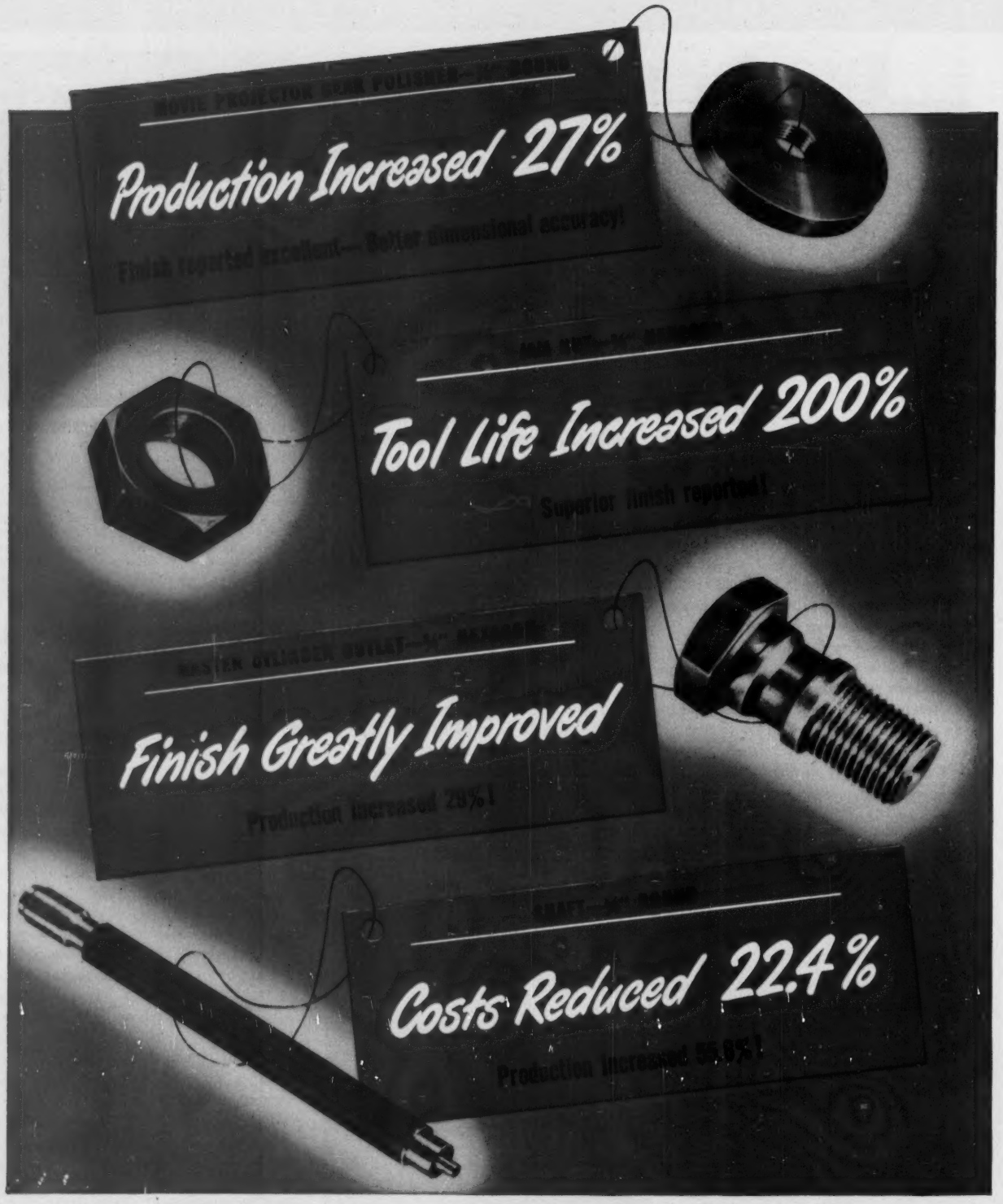
Remedy those fatigue-failures

Tools such as chisels, that are subjected to repeated stresses, often fail suddenly. As the tools are made from shock-resisting steel, these sudden failures can look mysterious. But close examination of the failed parts will often reveal that the failures were actually not sudden but occurred by progression of a crack part way through the section, followed by sudden fracture of the remaining section.

Fatigue-fractures have a characteristic, smooth-rubbed surface where the initial crack opened up, and an inner crystalline zone revealed by the final sudden break. Often the smooth-rubbed surface shows parallel "oyster-shell" markings, and may even show evidence of rusting.

Fatigue-failures usually begin at a stress-concentration point. This may be a notch, a poor fillet, tool mark, accidental nick, or a stamping. Correcting such design or mechanical faults is the cure.

You can **look ahead** with confidence



to bigger output, lower costs

...when you do the job with MX

today's faster-cutting screw stock!

THIS is no news to the hundreds of shops that have switched from ordinary Bessemer screw stock to U·S·S Free-Machining MX. It may be news to you.

During the past few years, results obtained in producing over a billion screw machine parts of many different kinds have established these facts; 1) wherever you put fast-cutting MX to work, production goes up and costs come down; 2) you can safely figure that MX will cut the cost of *any* part you now machine from ordinary Bessemer screw stock; 3) the more machine work your parts require the greater your savings will be.

Can you afford to ignore these well-proved benefits?

If you haven't tried MX on a production basis, now is a good time to start. Prove on your own machines that despite its slightly higher cost, MX is actually the most economical bar stock yet developed.

The reason is simple. U·S·S Free-Machining MX cuts cost in four ways. By increasing the rate of production, *it lowers the cost per part.* By prolonging tool life, *it reduces downtime.* By assuring better part finish it often *eliminates extra finishing operations.* By providing closer dimensional accuracy, *rejections are minimized.*

U·S·S Free-Machining MX is being produced in all the popular bar sections and sizes. You can obtain it in cold-finished form from your regular supplier as "MX" or under his own identifying trade name. In hot-rolled form, MX is available direct through our nearest district sales office.

For more parts and better parts—at lower cost per part—standardize on MX.

UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND · COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
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UNITED STATES STEEL

for a few pounds of copper... or a truckload... Call Chase

Need just a few lengths of seamless brass tube? We'll be glad to hand them to you "over the counter." Or if your job calls for large quantities of brass or copper sheet, rod, wire or tube, we can speed it on its way to you. That's the kind of service you can get by calling your nearest Chase warehouse.

We can supply you, subject to government controls, with hundreds of items for production, maintenance or repair. That's why it pays to "try Chase first" for anything in brass or copper.

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Chicago	Houston†	Newark	Rochester†	(†sales
Cincinnati	Indianapolis	New Orleans	St. Louis	office only)

GRAPH-MO® TOOL STEEL

that machines 30% faster

NOW AVAILABLE IN HOLLOW BARS!

ADVANTAGES OF GRAPH-MO

- Most stable tool steel made
- Outwears others 3 to 1
- Machines 30% faster
- Minimum tendency to pick up, scuff or gall
- Uniform response to heat treatment

PLUS

ADVANTAGES OF HOLLOW BARS

- No drilling
- Finish boring is first step
- Less machining time
- Less scrap loss
- More parts per ton of steel

EQUALS

ADVANTAGES OF "GRAPH-MO HOLLOW-BAR"

New "GRAPH-MO HOLLOW-BAR" combines the faster machining and longer wear of Graph-Mo with the economy of a hollow bar section.

Graph-Mo® graphitic tool steel now comes with a built-in hole! "Graph-Mo Hollow-Bar" is a new Timken® steel product that combines all the proven advantages of Graph-Mo with the economies of a hollow bar section.

If you make ring gages, dies or other ring-shaped tool steel parts, you can eliminate drilling. The hole is already there. Finish boring is your first step. You reduce machining time, cut scrap loss, save steel.

All this on top of the proven advantages of Graph-Mo steel itself!

Due to the free graphite in its structure, Graph-Mo machines 30% faster than other tool steels. Machinability tests prove it! And the free graphite, together with diamond-hard carbides, give it unusual resistance to wear. User reports prove it outwears other tool steels an average of 3 to 1.

Graph-Mo has minimum tendency to pick up, scuff or gall, gives uniform response to heat treatment, is the most stable tool steel made!

Only the new "Graph-Mo Hollow Bar" gives you all these advantages *plus* the economies of a hollow bar section. You can get "Graph-Mo Hollow Bar" in sizes ranging from 4″ to 16″ O.D. with a variety of I.D. dimensions. It's distributed through A. Milne and Company and Peninsular Steel Company and is available in the following cities: New York, Boston, New Britain, Philadelphia, Buffalo, Pittsburgh, Cleveland, Akron, Dayton, Toledo, Detroit, Grand Rapids, Indianapolis, Chicago and San Francisco.

For complete information on this new Timken steel product write today to The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

They SAVE YOU WORK!

Bunting Standard Stock Bearings

Costly machining is practically eliminated when you buy Bunting Standard Stock Bronze Bearings for production or maintenance of machine tools and industrial machinery. These Bunting Bearings are completely machined and finished when you get them from your Bunting Distributor. They can be fitted to unusual applications with very little further finishing.

The Bunting Distributor

Your Bunting Distributor is an industrial distributor or a specialist in certain industrial items. You will find him listed in the classified section of your telephone book—most likely under the heading Bars, bronze or Bearings, bronze. If he is the leading distributor, he almost certainly is the Bunting Distributor. He carries in stock, for your money saving convenience, completely machined and finished Bunting Standard Stock Industrial Bearings, Electric Motor Bearings and Precision Bronze Bars in a complete range of sizes meeting all your usual production and maintenance needs. Ask him for catalog.

Bunting®

BRONZE BEARINGS • BUSHINGS • PRECISION BRONZE BARS

THE BUNTING BRASS & BRONZE COMPANY • TOLEDO 1, OHIO • BRANCHES IN PRINCIPAL CITIES
DISTRIBUTORS EVERYWHERE

Looking for something special?

J&L provides you with Cold Finished Steel that's—

CARBON RESTORED . . . ANNEALED
NORMALIZED . . . BRIGHT ANNEALED

Our cold finishing bar mills now include a modern controlled atmosphere furnace for the thermal treatment of cold finished steel. This latest addition to Jones & Laughlin Steel Corporation facilities can mean cash in the till for *you* . . . cash that's measured in terms of cold finished bars that lower production costs, increase output and assure top-flight quality in the finished products you are producing.

Why not get in touch with J&L *today*? We'll be glad to provide detailed information relating to your specific needs. Our contact metallurgists are available to work *with* you to determine how *you* can use these special J&L cold finished steels to gain the advantages of improved machinability, exact mechanical properties, increased ductility, or elimination of the necessity to remove "decarbed" surfaces.

JONES & LAUGHLIN STEEL CORPORATION, PITTSBURGH, PA.

FILL IN THE COUPON NOW!

Jones & Laughlin Steel Corporation
473 Gateway Center, Pittsburgh 30, Pa.

☐ Without obligation please send me your booklet "Extra Services to Users of Cold Finished Steel."
☐ Please have your representative call.

Name_____
Title_____
Company_____
Address_____

SHOP TIPS

New, Free Magnet Idea Kit for Shops

A handy new literature kit showing the hows and whys of permanent magnets is currently sparking shop men to real savings in time, money, effort.

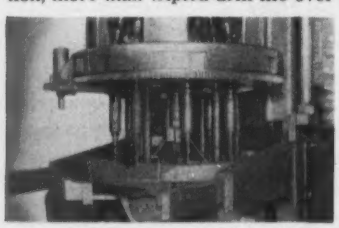
To date, the magnets have proved very effective as sheet steel separators, magnetic stands, tool-holding devices, sweepers' "pickup" tools, paper grippers and tool retrievers, to name a few uses.

Magnet Idea Kit can be obtained free from Carboloy Department of General Electric Co. (See address at right.)

* * *

Drill Cast Iron with Carbide Twist Drills

Drilling cast iron with carbide twist drills is definitely past the "maybe" stage. Users report doubled production, more than tripled drill life over



H.S.S. drills, without any special drilling equipment or job engineering. Sound, how-to-do-it technical bulletins available free. Write Carboloy Department of General Electric Co. (See address at right.)

* * *

New Masonry Drills Won't Stall, Pack

An outstanding advance in rotary drilling of masonry was recently unveiled in Carboloy oval-flute "Live-Spiral" Drills.

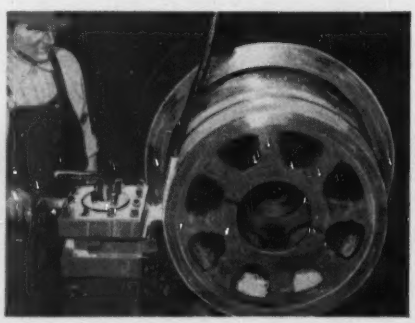
The drills, tipped with Carboloy cemented carbide, won't stall or pack even at very rapid speeds. They work equally well in concrete, brick, plaster, slate or asphalt. For full details write Carboloy Department of General Electric Company. (See address at right.)

YOUR CARBOLOY FIELD ENGINEER SAYS—

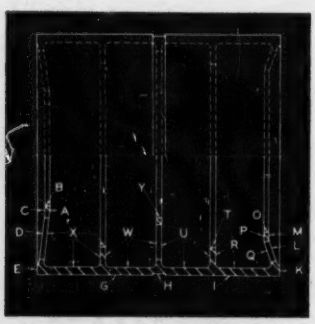
We can help you get swift tool-

Here's how one leading manufacturer quickly adapts low-cost Standard Carboloy Tools to his single-point tool machining operations – jobs that would normally require costly "specials" – and gets them on the jobs *in minutes*. No special grinding equipment. No delays or heavy inventories. By standardizing on "Standards," he gets full carbide benefits shop-wide – just as you can. Check these pages. Then send me blueprints of your tough single-point tool jobs. We'll show you how easily "Standards" can be best for you, too.

1 Gets 14 "specials" from these 4 styles of "Standards" – A large Midwestern manufacturer (name on request) needed 14 specially shaped tools for a rush job on cast steel gear blanks. From their stocks they selected the 4 Standard Carboloy Tool styles shown . . . ground them to the shapes needed in minutes per tool. No long waits for costly "specials," no extra expense or production delays. (See illustrations, below and on right-hand page.)

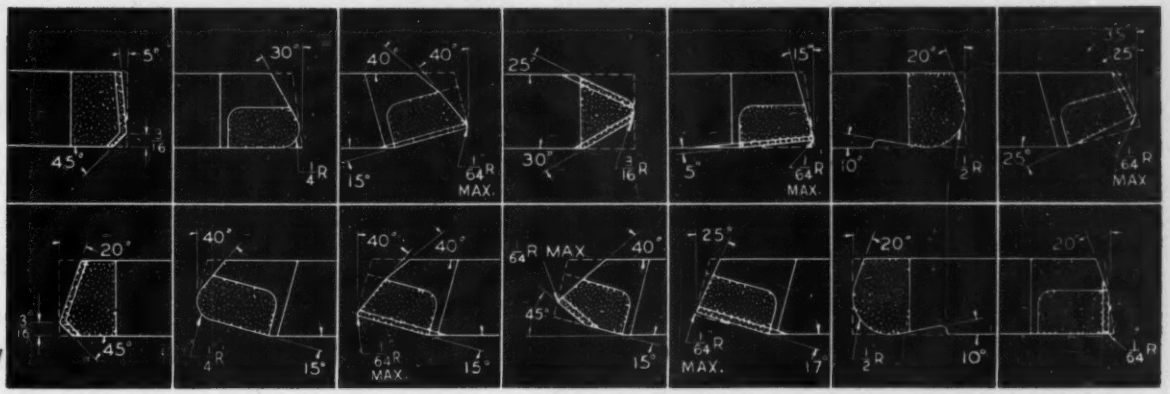


Here is the job – a tough steel casting 26" in dia., 28" wide, and requiring a wide variety of rough and finish turning, facing and boring operations.



Sketch of side view of part showing many of the single-point tool machining operations necessary for the job.

convert to Standard Carboloy Tools and ups, low inventories, lowest tool cost



Dotted lines show the original tip ends of the 4 styles of Standard Tools before they were ground to these 14 special shapes in minutes.

2 **Easy for you to use, also**—Adapting Standard Carboloy Tools to your special-tool needs is a cinch. They can be rough-ground quickly on ordinary silicon carbide wheels, finished economically on diamond wheels. Standard Carboloy Tools stay sharp up to 10 times as long as high-speed steel tools, last 10 times longer, too.

3 **You get quicker tool-ups** – You'll cut tooling delays to minutes instead of days or weeks with "Standards" on your shelves. Your inventories will be lower – costs, too. Just 11 styles of Standard Carboloy Tools can be adapted to do up to 80% of all your single-point tool machining.

4 **You enjoy plant-wide benefits** – Let us help you convert to standard styles of Carboloy Tools – for plant-wide benefits. Thousands of shops have done so . . . and now profit from such things as production gains of up to 300%, downtime savings that alone more than pay for the entire cost of the tools.

To get maximum performance from Standard Carboloy Tools, we have the industry's best all-around Carbide Service Program. Includes all types of free how-to-do-it technical data, a tuition-free training school, etc. For details, mail coupon today.

CARBOLOY TOOLS ARE STOCKED COAST TO COAST BY

AUTHORIZED CARBOLOY CEMENTED CARBIDE DISTRIBUTORS

Look under "Tools" in the Yellow Pages of your local telephone book, or in Thomas' Register, for address and phone number of your nearby Carboloy distributor, branch or district office.

* "Carboloy" and "Live-Spiral" are registered trademarks of Carboloy Department of General Electric Company

5 **Send blueprints of your "specials"** – Let us review your single-point tool machining jobs that now require costly special tools . . . show you exactly what "Standards" can be adapted, and how. Send blueprints today to the factory at Detroit, or to your nearest Carboloy District Office. No charge or obligation. See coupon below.

MAIL COUPON TODAY!

CARBOLOY

DEPARTMENT OF GENERAL ELECTRIC COMPANY

11147 E. 8 Mile Ave., Detroit 32, Michigan

Gentlemen: Please send me, at no cost or obligation, Carboloy General Tool Catalog, GT-250.

☐ Also, I am enclosing ( ) blueprints or sketches of the single-point tools we use. Show me, free of charge, which low-cost Standard Carboloy Tools can be quickly ground to these special shapes (and how to do it).

Name_____ Position_____

Company Name_____

Address_____

City_____ Zone____ State_____

CUMBERLAND GROUND BARS

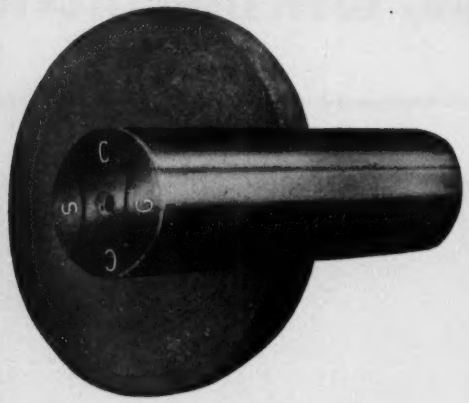
We manufacture 8" diameter, 7-1/2", 7", 6-1/2", 6", and also odd and intermediate sizes down to and including 1-1/8".

ON THE WEST VIRGINIA SHORE, OVERLOOKING THE POTOMAC RIVER, STANDS THE JAMES RUMSEY MONUMENT

The first practical steamboat in the world was run on the Potomac River a few miles below Cumberland, Maryland.

GEORGE WASHINGTON said in his diary, under date of September 6, 1784: "Remained at Bath all day and was showed the Model of a boat constructed by the ingenious Mr. Rumsey, for ascending rapid currents by mechanism; the principles of this were not only shown, and fully explained to me, but to my very great satisfaction, exhibited in practice in private under the injunction of secrecy—."

At a later date GEORGE WASHINGTON said in his diary: "Spent the afternoon with Mr. Rumsey and then Alexander Hamilton and I rode on to Cumberland, Maryland."



Symbol of Quality

Approximately 100 years after the exhibit of this steamboat, Cumberland began grinding bars. They found through experience this was the best method by which accurate steel bars could be produced. These bars are so carefully ground that they are adapted for mass production where gears, pulleys, sprockets and bearings must slide on the bars without delay due to filing or fitting.

IMMEDIATE BARS

DISTRIBUTED BY

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Buffalo, N. Y.—Jos. T. Ryerson & Son, Inc.
Cambridge, Mass.—Brown-Wales Company
Charlotte, No. Carolina—Edgcomb Steel Co.
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Detroit, Michigan—Central Steel & Wire Co.
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Lakeland, Fla.—Mine & Mill Supply Co.
Los Angeles, Calif.—Link-Belt Co., Pacific Div.
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Martinsburg, W. Va.—W. H. Heiston & Son
Milwaukee, Wis.—Central Steel & Wire Co.
Montreal, Canada—Drummond, McCall & Co., Ltd.
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New York City, N. Y.—Bright Steel Corp.
Oakland, Calif.—Link-Belt Co., Pacific Div.
Philadelphia, Pa.—Charles Bond Company
Philadelphia, Pa.—Horace T. Potts Co.
Pittsburgh, Pa.—McKee-Oliver, Inc.
Portland, Maine—W. L. Blake & Company
Portland, Oregon—Link-Belt Co., Pacific Div.
Providence, R. I.—Congdon & Carpenter Co.
San Francisco, Calif.—Link-Belt Co., Pacific Div.
Seattle, Wash.—Link-Belt Co., Pacific Div.
Spokane, Wash.—Link-Belt Co., Pacific Div.
Toronto, Canada—Drummond, McCall & Co., Ltd.
Worcester, Mass.—Pratt & Inman

CUMBERLAND STEEL COMPANY

CUMBERLAND, MARYLAND, U. S. A.
ESTABLISHED 1845 INCORPORATED 1892

Ask ALCOA about threading and tapping aluminum screw machine stock

Cutting threads in aluminum is easy if you follow simple procedures of alloy selection, tool preparation and machine setup.

Where possible, use a die head with adjustable chasers rather than a solid die. Spiral taps are preferred to straight fluted taps, especially for deep-hole tapping operations.

Taps and dies remove a large amount of metal in proportion to their size. To reduce the load, have the blank or hole diameter of the part near the tolerance limit favoring the removal of the least amount of metal.

Both taps and dies should have a top rake angle ground on the leading edge of the tool. On some jobs, both taps and dies will cut better if a hook is ground along the leading edge of the lands to the third full thread, at about 5° to the axis of the tap or chaser. Tap flutes should be highly polished. Tap lands should be relatively narrow to reduce friction between the tool and the work.

Your local Alcoa sales engineer will gladly answer your questions on machining, alloy selection and finishing. You'll find him listed under "Aluminum" in the classified phone book.

ALCOA OFFERS TWO BOOKS— *Alcoa Aluminum in Automatic Screw Machines*—a 95-page book containing information on tool design, setup and operating techniques. *Corrected Tool Diameter Tables*—a 64-page book giving corrected tool diameters for circular form tools and flat form tools under conditions of 0°, 5° and 10° top rake.

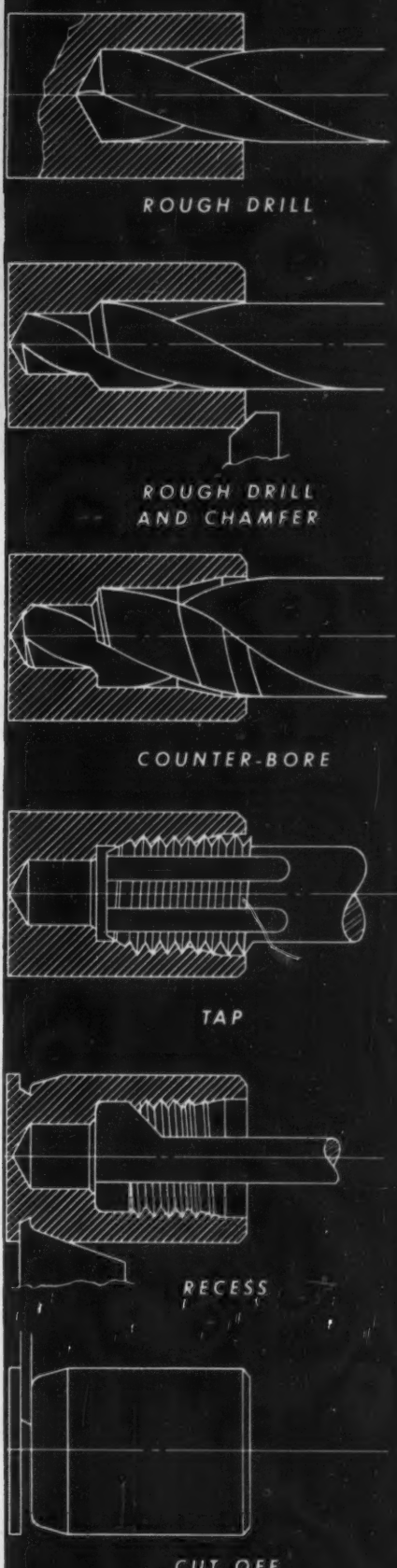
ALUMINUM COMPANY OF AMERICA
870-B Alcoa Building • Pittsburgh 19, Pennsylvania

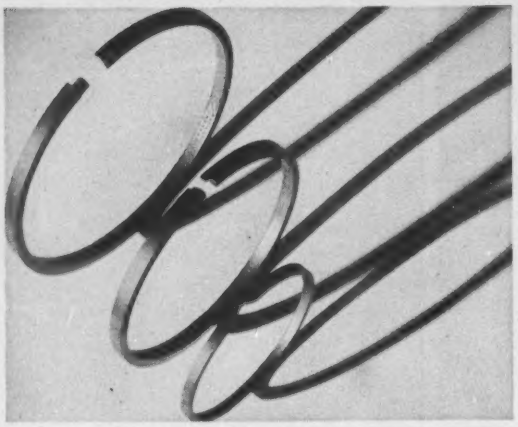
BASIC ECONOMICS FOR BUYERS

While you buy screw machine stock by the pound, you machine it by the foot. A pound of aluminum gives you three times more feet of stock than a pound of brass or steel.

Alcoa Aluminum

ALUMINUM COMPANY OF AMERICA





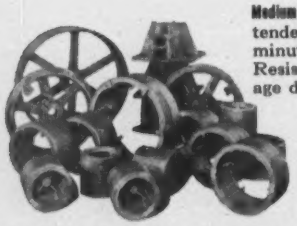
Light Castings . . . These piston rings are produced in Ni-Resist for engines used in corrosive service.

Investigate NI-RESIST...

No other cast metal provides such a unique combination of useful engineering properties

NI-RESIST® is available nationwide in 5 basic types to meet a variety of industrial demands: resistance to corrosion, heat and wear; strength and toughness; good machinability; high electrical resistance and non-magnetic characteristics . . . as well as heat conductivity and controlled thermal expansion.

At the present time, nickel is available for the production of Ni-Resist and other alloys containing nickel, for end uses in defense and defense supporting industries. The remainder of the supply is available for some civilian applications and governmental stockpiling.



Medium Castings . . . Free from tendencies to corrode, comminutor parts cast in Ni-Resist lengthen life of sewage disposal equipment.

Heavy Castings . . . Casing, outer column and discharge head of this 14-ton pump are cast in Ni-Resist for resistance to salt water and other corrosive media.

SOURCES OF SUPPLY FOR NI-RESIST CASTINGS

EASTERN SECTION...

Abrasive Alloy Castings Co.
Bridgeboro, N. J.

American Abrasive Metals Co.
Irvington, N. J.

American Brake Shoe Co.
230 Park Avenue
New York 17, N. Y.

American Brake Shoe Co.
Engineered Castings Division
10 Mt. Read Blvd.
Rochester 11, N. Y.

American Chain & Cable Co., Inc.
Acco Casting Division
Reading, Pa.

The Baldwin-Lima-Hamilton Corp.
Eddystone Division
Paschall P. O.
Philadelphia 42, Pa.

Barnett Foundry & Machine Co.
536 Lyons Avenue
Irvington, N. J.

Curtiss-Wright Corp.
Metals Processing Division
162 Grider Street
Buffalo 11, N. Y.

Hunt-Spiller Manufacturing Corp.
383 Dorchester Avenue
South Boston 27, Massachusetts

Janney Cylinder Co.
7425 State Road
Philadelphia 36, Pa.

Koppers Company, Inc.
Metal Products Division
Bush & Hamburg Streets
Baltimore 3, Maryland

Kutztown Foundry & Machine Corp.
Kutztown, Pa.

Montague Machine Company
Turners Falls, Massachusetts

Olney Foundry, Link-Belt Co.
180 W. Duncannon Avenue
Philadelphia 20, Pa.

The Richmond Foundry & Mfg. Co., Inc.
Hermitage Road
Richmond 20, Illinois

The Taylor & Fenn Co.
Saville Street
Windsor, Connecticut

Weatherly Foundry & Mfg. Co.
Weatherly, Pa.

MIDDLE SECTION...

American Brake Shoe Co.
Electro-Alloys Division
1936 Taylor Street
Elyria, Ohio

American Cast Iron Pipe Co.
P. O. Box 2603
Birmingham 2, Alabama

Baker Perkins, Inc.
1000 Hess Street
Saginaw, Michigan

Carondelet Foundry Co.
2101 S. Kingshighway
St. Louis 10, Mo.

Chicago Hardware Foundry Co.
2500 Commonwealth Avenue
North Chicago, Illinois

DeZurik Shower Co.
Foundry Division
Sartell, Minnesota

Duluth Brass Works Co.
5002 Ramsey Street
Duluth, Minnesota

The Duriron Co., Inc.
Dayton 1, Ohio

Engineering Castings, Inc.
405 South Linden
Marshall, Michigan

The Fahralloy Company
150th St. & Lexington Ave.
Harvey, Illinois

Frank Foundries Corp.
2020 Third Avenue
Moline, Illinois

The Hamilton Foundry & Machine Co.
1551 Lincoln Avenue
Hamilton, Ohio

Kingsport Foundry & Mfg. Corp.
East Sullivan and Main Streets
Kingsport, Tennessee

Michiana Products Corp.
P. O. Box 302
Michigan City, Indiana

Michigan Steel Casting Co.
1999 Guoin Street
Detroit 7, Michigan

Moran Flexible Joint Co., Inc.
215 West Main Street
Louisville 2, Kentucky

Reda Pump Co.
Bartlesville, Oklahoma

Ross-Meehan Foundries
1601 Carter Street
Chattanooga 1, Tennessee

St. Paul Foundry & Mfg. Co.
500 Como Avenue
St. Paul 3, Minnesota

Service Foundry Division
Avondale Marine Ways, Inc.
416 Erato Street
New Orleans 13, Louisiana

Shenango-Penn Mold Co.
Dover, Ohio

Standard Brass & Mfg. Co.
P. O. Box 1469
Port Arthur, Texas

The Sterling Foundry Co.
Wellington, Ohio

Texaloy Foundry Co.
1407 Hoefgen Avenue
San Antonio 3, Texas

The W. S. Tyler Co.
3615 Superior Avenue
Cleveland 14, Ohio

Wells Manufacturing Co.
7800 North Austin Avenue
Skokie, Illinois

WESTERN SECTION...

Centrifugal Casting Co.
3245 Cherry Avenue
Long Beach 7, California

Dameron Metal Sales Co.
927 South Sante Fe Avenue
Compton, California

Electric Steel Foundry Co.
2141 North West 25th Avenue
Portland 10, Oregon

Pacific Foundry Co., Ltd.
3100 19th Street
San Francisco 10, California

Stanley Foundries
6009 Santa Fe Avenue
Huntington Park, California

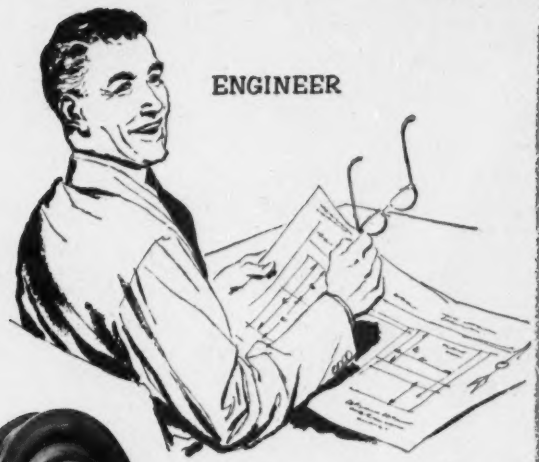
Utility Steel Foundry
3320 East Slauson Avenue
Vernon (L. A.) California

THE INTERNATIONAL NICKEL COMPANY, INC.

67 WALL STREET
NEW YORK 5, N. Y.

The Blanks They Recommend—and Why

ENGINEER



"In designing our machines, we have to consider both strength and weight. When we need circular steel blanks, we ask Purchasing to get them from Bethlehem. Bethlehem blanks are so strong that we can sometimes use thinner sections. This reduces weight."

METALLURGIST

"Bethlehem has an unusual method of forging and rolling the blanks in a single operation. Tests we've run show homogeneity and very good grain structure. Also, the blanks can be furnished untreated or heat-treated, as we prefer."

MACHINIST

"I get along with 'em fine. They don't give me any trouble. They're free of the flaws that sometimes make you discard a piece and begin all over. Nice easy cutting all the way."

PURCHASING AGENT

"We have to watch costs, and Bethlehem blanks are competitive price-wise. Deliveries dependable, too. And we like the wide range of sizes —10 to 42 in. OD. As a company buyer, I've got Bethlehem circular blanks on my preferred list."

Bethlehem suggests that you, too, request these sturdy steel products when making gears, crane or sheave wheels, flywheels, turbine rotors, tire molds, brake drums, industrial wheels, or anything else of similar nature. Ask for full details—or write for a free copy of illustrated Booklet 216.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM ROLLED-and-FORGED CIRCULAR PRODUCTS

You can keep speeds and feeds on the high side...

when machining *Carpenter* stainless!

If you believe all stainless steels are "alike", you may be missing this opportunity to run your stainless machining jobs faster, more profitably! Plant records prove there is a difference in the uniformity and machinability of different makes of Types 416 and 303 Stainless. These same records show that with Carpenter No. 5 (Type 416) or No. 8 (Type 303), jobs went through without a hitch ... where with other makes reports showed trouble with rejects, tolerances or finishes. The job described below is a good example! Consistent stainless fabrication results like this are possible in your plant ... because Carpenter makes stainless that takes a cut smoothly, at higher speeds ... stainless that feeds through your machine with day-in, day-out uniformity. This steel comes to you from the same mill that invented the first Free-Machining Stainless. You'll never know what you're missing until you specify "Carpenter". Best proof in the world is a trial order. The Carpenter Steel Company, 105 W. Bern St., Reading, Pa.

After changing from an ordinary Type 303 to Carpenter Stainless No. 8 (Type 303) for this aircraft aileron control, the records show: 25% better machining, 10% less rejects, improved finishes that eliminated grinding.

Export Department: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

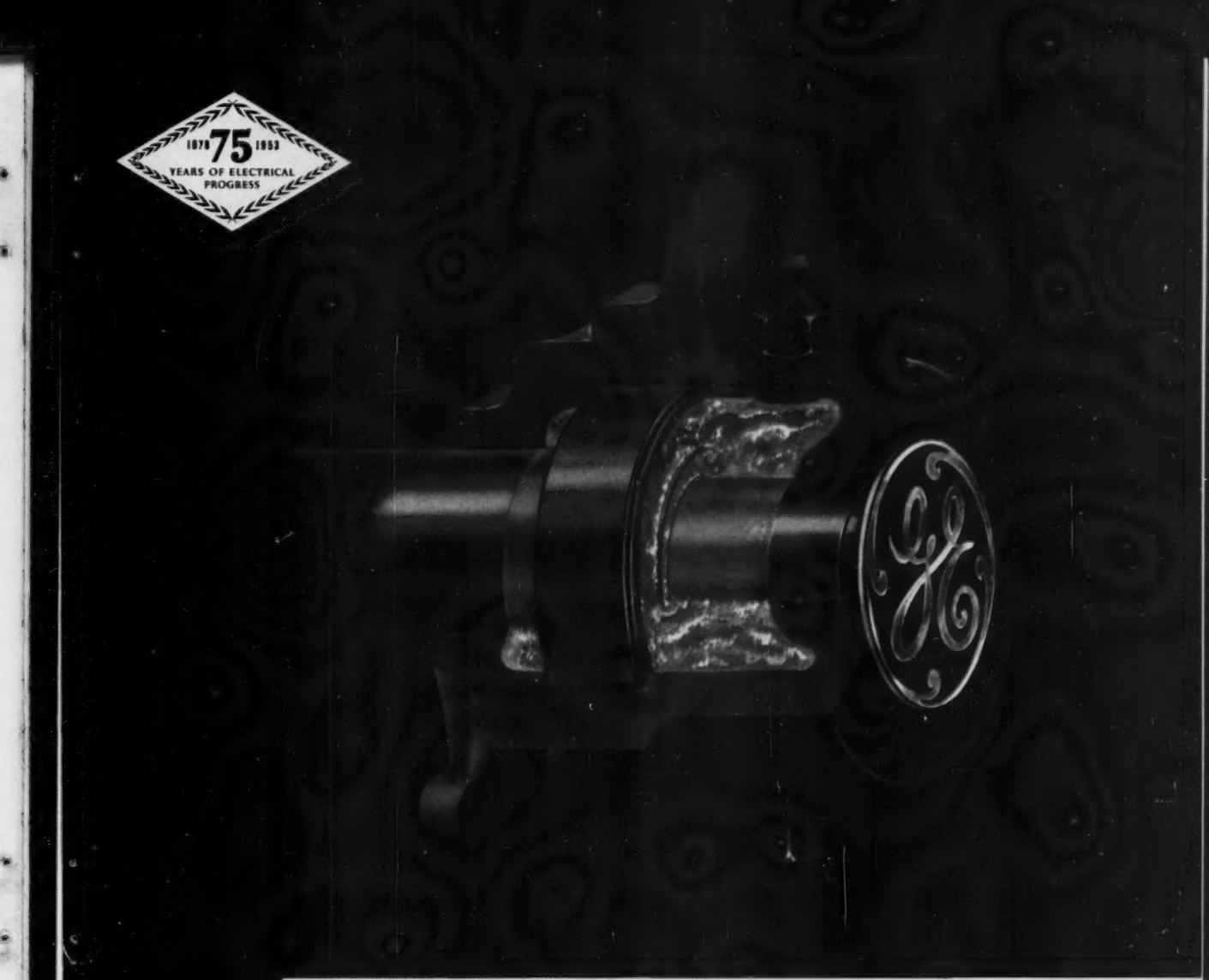
Carpenter STEEL

Free-Machining Stainless

takes the problems out of production

Call your nearest Carpenter Mill-Branch Warehouse, Office or Distributor

1878 75 1953
YEARS OF ELECTRICAL PROGRESS



These bearings last longer than life . . . grease life

G-E TRI-CLAD MOTORS LAST LONGER

REG. U.S. PAT. OFF.

ALL GREASE LIFE IS LIMITED. The best known greases dry out in time. This may be six months, seven years, or longer, depending on motor application.

SOME MOTORS ARE USELESS WHEN GREASE DRIES OUT. They can't be regreased, you lose production time . . . because your maintenance man is "sealed out."

BUT GREASE LIFE NEED NOT LIMIT MOTOR LIFE. Tri-Clad motors give long life without relubrication, plus provision for adding new grease when necessary.

ADDED GREASE IS USEFUL GREASE. Relubrication puts fresh grease in storage in bearing housing . . . as motor operates, grease oils migrate to bearing as needed.

TRI-CLAD MOTOR BEARING IS EASIEST TO REGREASE. Do it on the job, with motor running . . . no dismantling . . . no trip to a service shop.

TRI-CLAD MOTOR BEARING IS BETTER PROTECTED. Completely enclosed housing has *longer seals* to keep dirt out, *larger grease supply*, and *scientific design* for continual grease migration.

THIS PRACTICAL BEARING DESIGN is one more reason why G-E Tri-Clad motors give better service . . . added life. Order through your nearby G-E Apparatus Sales Office or authorized G-E agent or distributor. General Electric Company, Schenectady 5, N. Y.

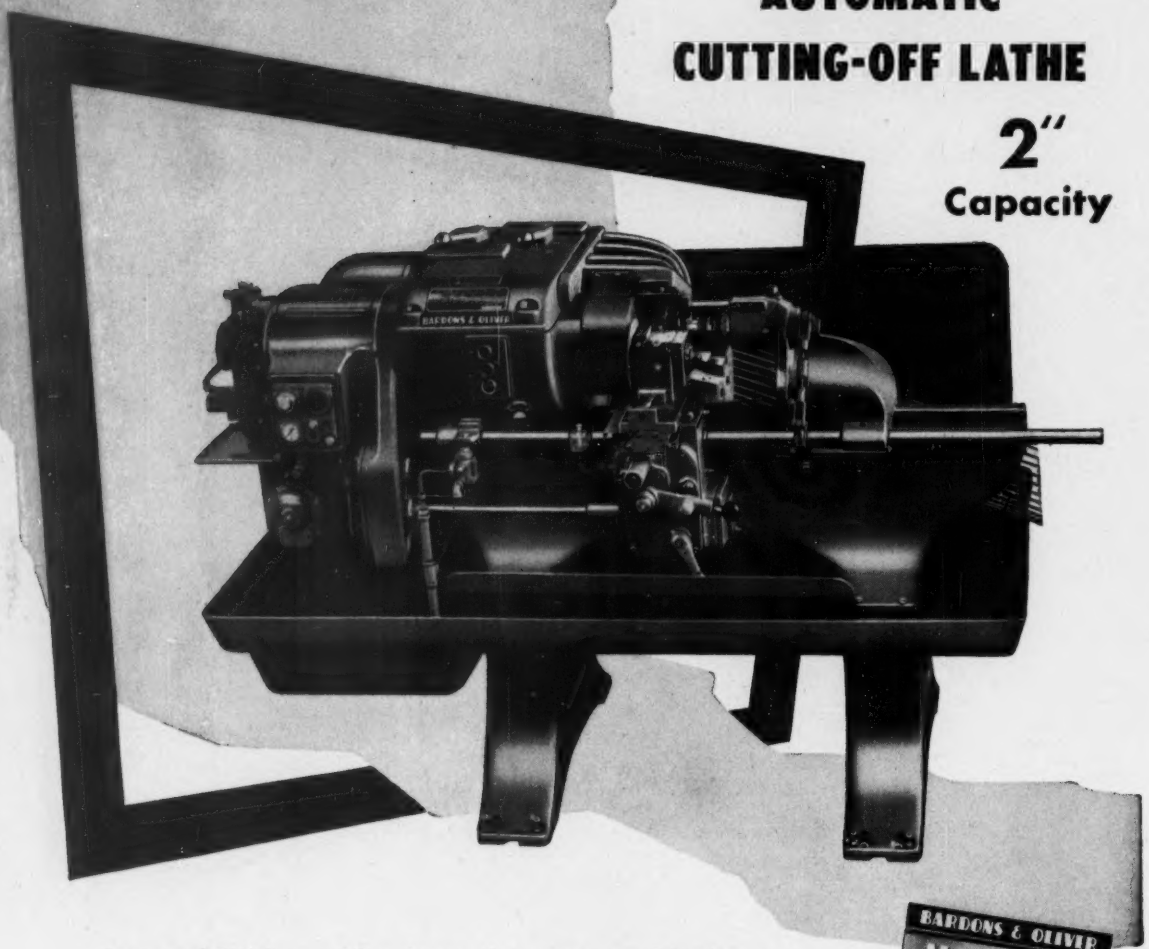
752-18

You can put your confidence in

GENERAL ELECTRIC

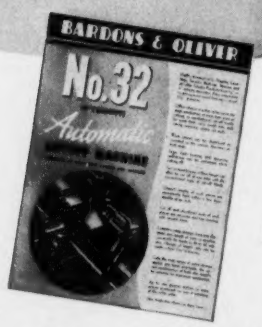
Improved...

BARDONS & OLIVER
MODEL NO. 32
AUTOMATIC
CUTTING-OFF LATHE
2" Capacity



Increased Rigidity and Sturdiness of the entire tool feeding mechanism results in more continuous production and assures a longer, accurate life of the machine.

The machine is capable of over 100 cycles per minute . . . its production *AVERAGE* is 30,000 pieces in an 8 hour day. Highly productive for nipples, couplings, ferrules, bushings, spacers, and all other tubular products.



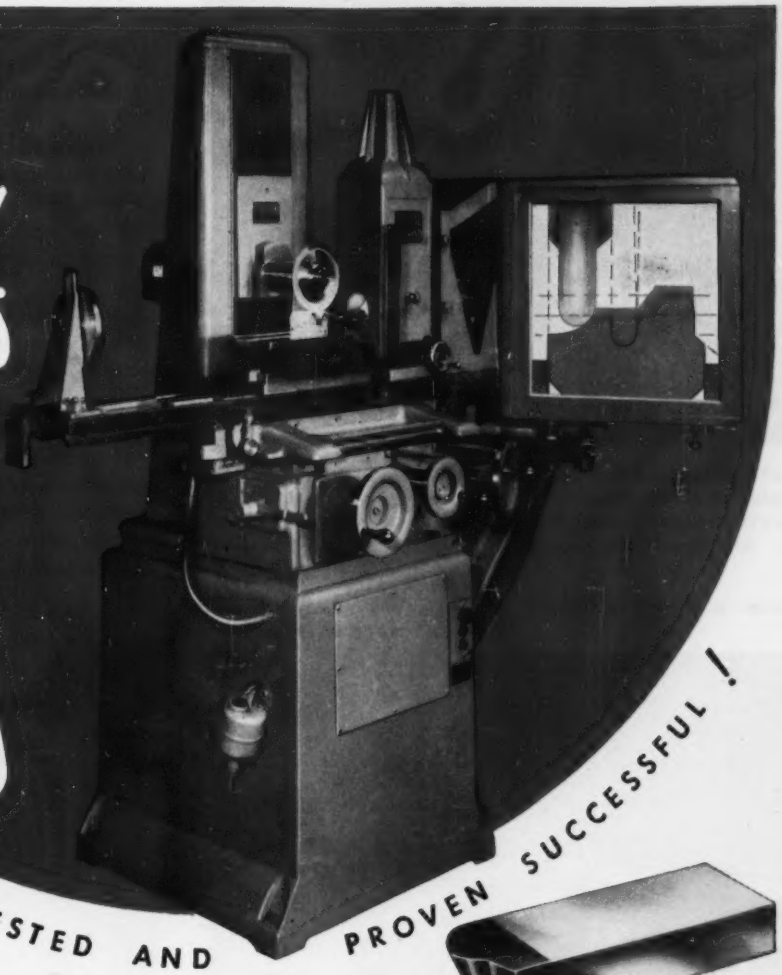
Write us on your company's letterhead for this new Catalog.

BARDONS & OLIVER, INC.

1135 WEST 9TH STREET • CLEVELAND 13, OHIO

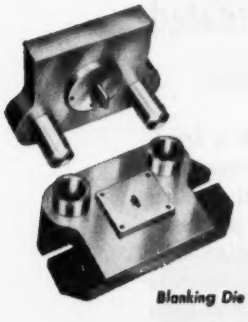
Positive Results with VISUAL GRIND

TRADE MARK

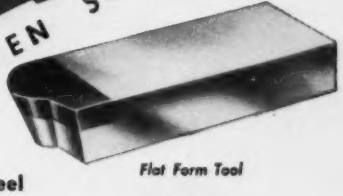


TESTED AND PROVEN SUCCESSFUL !

Progressive Die



Blanking Die



Flat Form Tool

Circular Form Tool

Dovetail Tool

Here is precision contour grinding at its best. Steel and tungsten carbide form tools, die sections, templates and related items are efficiently processed in dependable, economical fashion. Our basic magnetic chuck work-holder affords positive positioning yet with flexibility for cam, circular and index grinding with the proper fixtures. Workpiece quality is controlled visually at all stages, either while using pre-dressed grinding wheels or when generating the required contour by means of successive, controlled movements. Durable construction around precision optics insures rigidity and long life.

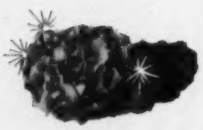
Ask for Bulletin "M-2"

VISUAL GRIND

THE CLEVELAND GRINDING MACHINE COMPANY

1643 EDDY ROAD • CLEVELAND 12, OHIO

New Possibilities in Optical Grinding



Here's the start...

of the new concept that created CINCINNATI Grinding Wheels

Cincinnati Grinding Wheels began with a frank recognition of the grinding grit as a cutting tool. For research discoveries by Cincinnati Milling proved, beyond doubt, that the grinding process is a true metal cutting process. The grinding grits (such as the one magnified above) do not abrade or wear away the surface of a workpiece but form chips which agree in classification with the basic chip types found in other metal cutting processes.

This entirely new approach is not based on hasty conclusions. It represents 25 years of Cincinnati Milling research, coupled with practical experience

in applying the basic fundamentals of grinding to a wide variety of work on both centerless and centertype machines.

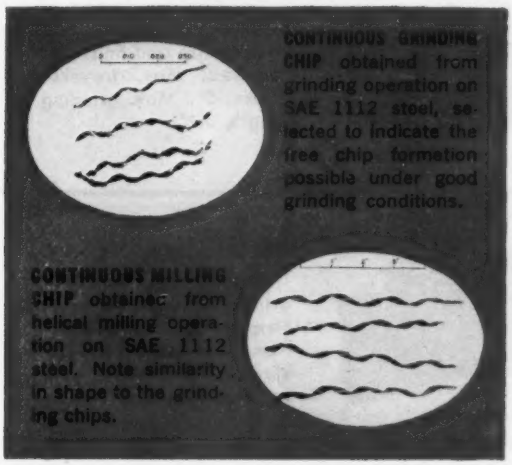
This new concept is the beginning of a new approach to grinding wheels—the development of the wheel as a true cutting tool. And it is a development you might expect from Cincinnati Milling, with the world's largest background of research and experience in metal cutting operations.

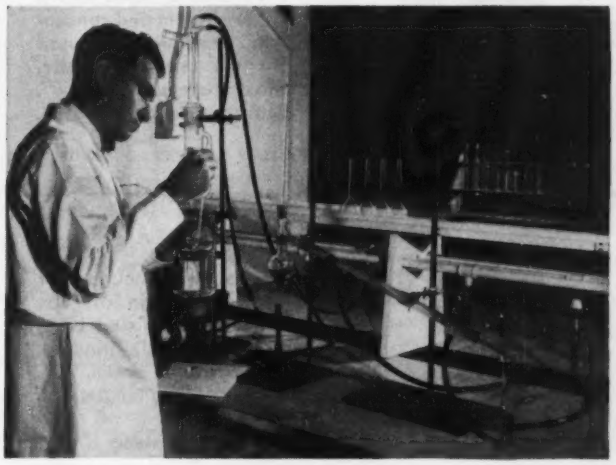
For you, this means grinding wheels developed and tested over a period of several years on the basis of true function—as true cutting tools forming true chips.

Available to you is a field organization of trained machinists who know grinding and grinding machines as well as grinding wheels. For a demonstration on your own machines of how to get the most out of Cincinnati Grinding Wheels, write, wire or phone Cincinnati Milling Products Division, The Cincinnati Milling Machine Co.

RESEARCH GRINDING problems have ranged from the grinding of surgical sutures .0004" in diameter to steel mill rolls 60" in diameter. A machinist of the research department is shown using special workpieces to compare wheel performance on a centertype grinder.

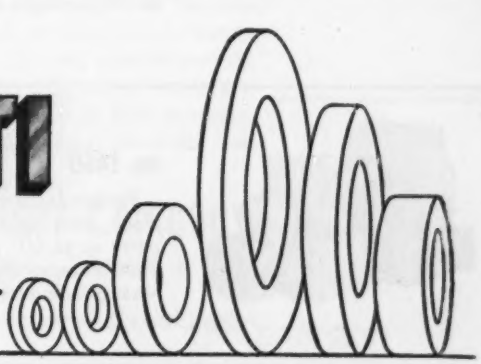
EXTRACTION APPARATUS is used by research laboratory to measure degree of maturity of resin bonds.


CONTINUOUS GRINDING CHIP obtained from grinding operation on SAE 1112 steel, selected to indicate the free chip formation possible under good grinding conditions.
CONTINUOUS MILLING CHIP obtained from helical milling operation on SAE 1112 steel. Note similarity in shape to the grinding chips.

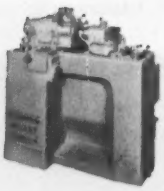


FREE BOOKLET. Now available to industry is a new booklet entitled "A New Concept In Grinding Wheels." It contains valuable information for everyone interested in grinding operations. A copy is yours for the asking. Write Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

CINCINNATI
Grinding Wheels
THE CINCINNATI MILLING MACHINE CO.
Cincinnati 9, Ohio



bryant
internal grinding

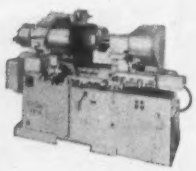


no. 1309-W

Finishes 2 bores and a taper straight and concentric. 2 wheelheads are used on this semi-automatic. Max. traverse stroke, 6". Max. grinding length, 3½".

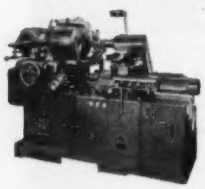
no. 1109

For high production of small bores where accuracy of size and finish are required. Max. traverse stroke, 6". Max. grinding length, 3½".



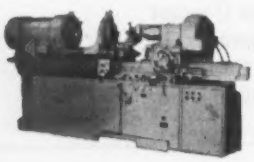
no. 1318

Two wheelheads for high production of jobs requiring face and bore, or face and O.D. grinding. Max. traverse stroke, 20". Max. grinding length, 8".



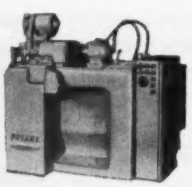
no. 1116

A general purpose hole grinder for tool room, small shop, or general production. Maximum traverse stroke, 20". Maximum grinding length, 8".



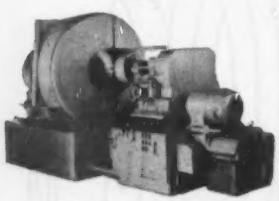
no. 1416

Specially designed for grinding bores in long work, such as machine tool spindles. Maximum traverse stroke, 20". Maximum grinding length, 8".



no. 1209

A fully automatic, high production machine for small and medium bore grinding. Max. traverse stroke, 6". Max. grinding length, 3".

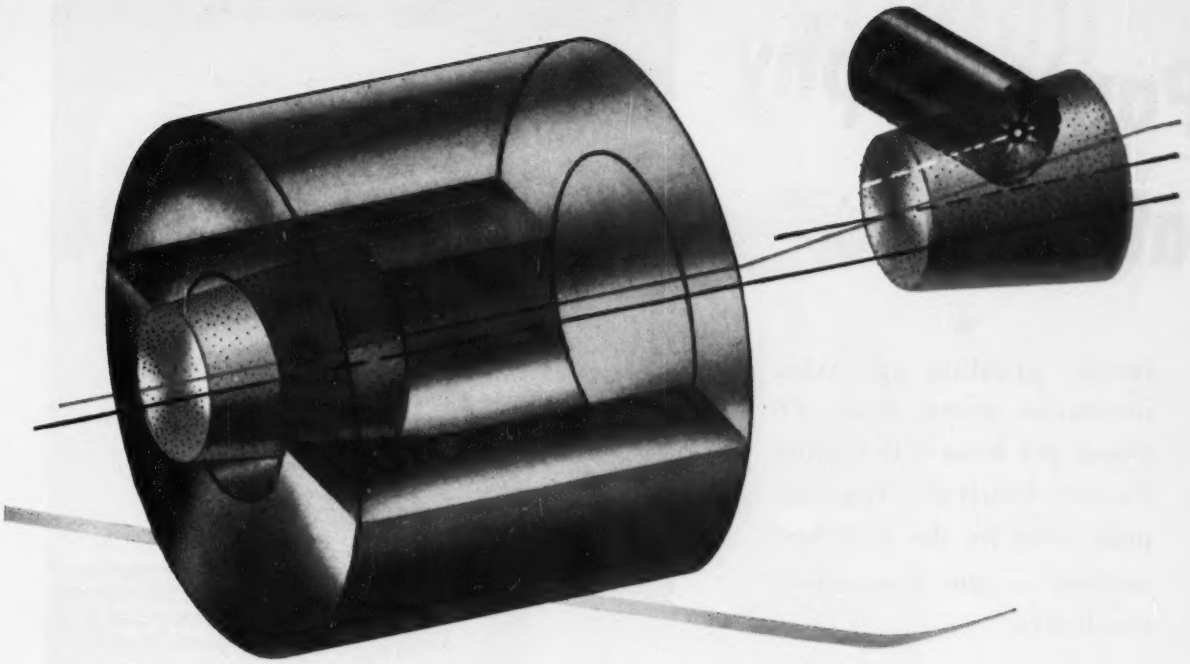


no. 1460

For production or single piece hole grinding on parts up to 60" diameter. Max. traverse stroke, 21". Max. grinding length, 16".

no. 2209

For precision and high production grinding of ball bearing races, gears, rolls, bushings, etc. Max. traverse stroke, 6". Max. grinding length, ¾".



IT is common assumption in internal grinding that once the grinding wheel passes the diamond, all errors will be eliminated and the wheel will be a perfect cylinder. It is also assumed that this grinding wheel can produce a straight hole. These two assumptions are true if the wheel path is a straight line parallel with the axis of the wheel as it passes the diamond and traverses the work.

In the illustration, the wheel slides are badly worn and the wheel path is not a straight line. The distortion in the ways causes the wheel to move gradually away from the diamond and the wheel is dressed to a taper as it passes the diamond. Then, as the tapered wheel traverses the work, it will grind only on its large diameter. At the point of reversal the tapered form will be transferred to the work. If the traverse stroke is lengthened, the tapered section will be moved to the new point of reversal. In addition, wheel wear will be excessive, finish will be poor, feed lines may be visible.

Available information advises simply turning the workhead or changing the length of traverse to correct taper. In the case illustrated, neither turning the workhead nor changing the length of traverse will produce a straight hole. The only possible remedy is to straighten the wheel slide ways which will, in turn, straighten the wheel path. The wheel will then contact the work properly, producing correct geometry of the hole, longer wheel life and better finish.

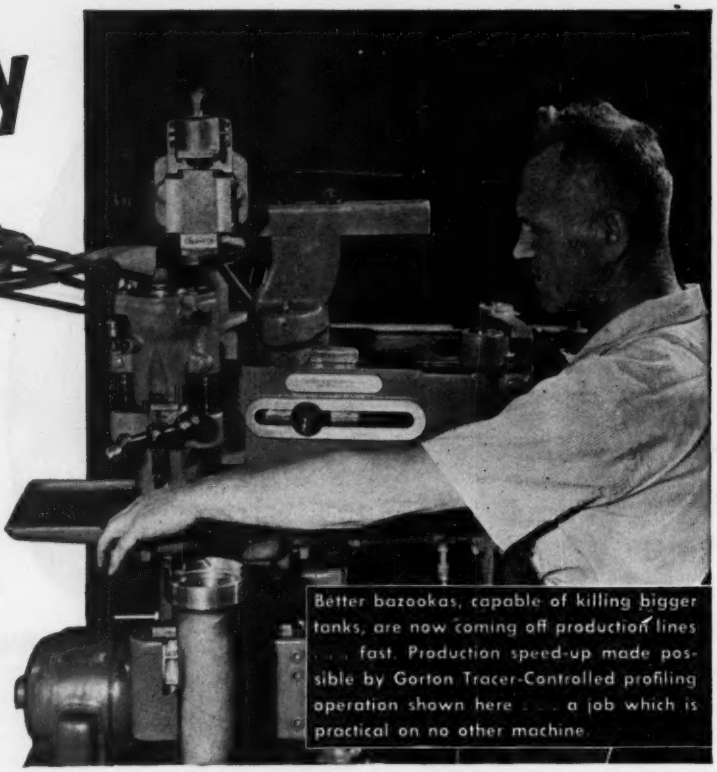
Bryant Chucking Grinder Company
Springfield, Vermont, U. S. A.

Internal grinders • Internal & External thread gages

Pantography at Work!

★

Inside profiling operation produces more than 36 pieces per hour with Gorton Tracer Control. Approximate time by the next best method . . . one piece every two hours.



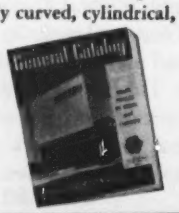
Better bazookas, capable of killing bigger tanks, are now coming off production lines . . . fast. Production speed-up made possible by Gorton Tracer-Controlled profiling operation shown here . . . a job which is practical on no other machine.

GORTON

- **IMPROVES QUALITY**
- **INCREASES PRODUCTION**
- **CUTS COSTS**

On many all-but-impossible jobs, Gorton Tracer-Controlled Pantographs and Duplicators speed up production on military or industrial contracts. High surface finish results from spindle speeds up to 45,000 R.P.M. Accuracy results from the use of over-size masters, patterns, or templates together with the reduction ratio which is exclusively characteristic of the pantograph. Whether a dozen or a thousand pieces, each is identical to the first. Work piece size varies from instrument parts to areas of 10 by 20 feet.

Gorton tracer-controlled equipment quickly pays for itself in profiling, routing, die sinking, mold cutting, counterboring, chamfering, grooving, graduating, engraving as well as many other standard or special operations on ferrous or non-ferrous metals and plastics where work is flat, uniformly curved, cylindrical, spherical or irregular in shape.



Mail the coupon below for General Catalog illustrating the complete Gorton line.

PRODUCTION DATA—

JOB: Profile 6 locking lugs for male and female sections of new 3.5" Bazooka.

MATERIAL: Aluminum alloy.

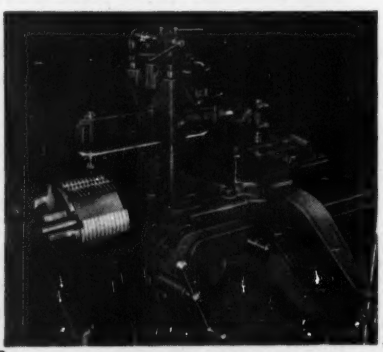
CUTTER: 5/32" dia. single flute, fast spiral H.S. steel running at 3,900 R.P.M., without coolant.

MASTER: 2 masters: one for male and one for female sections; 3 times oversize, traced manually.

HOLDING FIXTURE: Pneumatic-operated internal expanding type.

APPROX. TIME: 36 pieces per hour.

ALTERNATE METHODS: None practical.



THIS OPERATION SPEEDED UP 6 TIMES

Gorton Tracer Control chamfers ends of interrupted threads in breech ring and on breech block of 155 mm. gun. Previous time, 4 hours; Gorton time, 40 minutes.

GEORGE GORTON MACHINE CO.

1302 RACINE STREET RACINE, WIS., U.S.A.

Please send at once complete information about the Gorton line contained in Bulletin 1655-1302.

Firm .....

Name .....

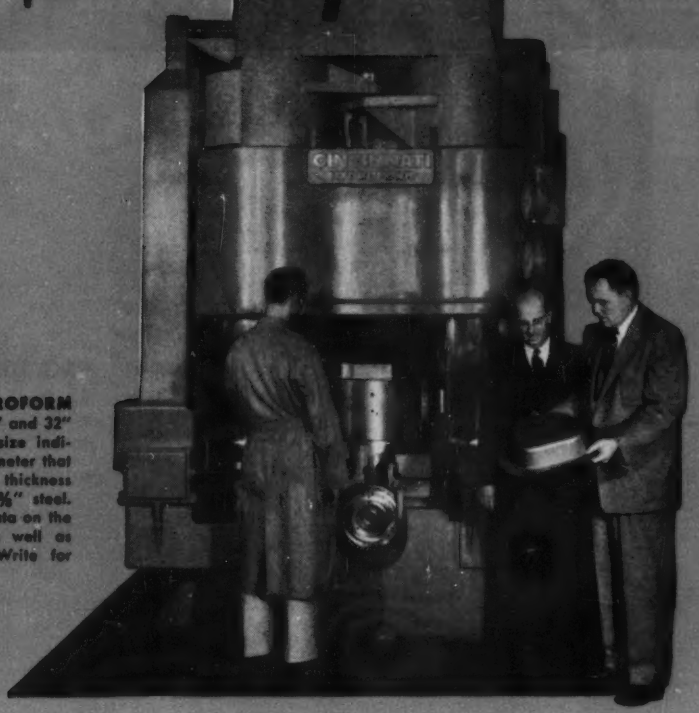
Title .....

Address .....

City, State .....

P3554-R

Industry's Newest Cost Cutting Method: Hydroforming



CINCINNATI 26" HYDROFORM
Also built in 12", 19", 23" and 32" standard sizes. Machine size indicates maximum blank diameter that can be formed. Material thickness can range from foils to ⅜" steel. Bulletin M-1759-1 gives data on the Hydroforming process as well as machine specifications. Write for your copy.

Hydroforming has given industry an improved, *simplified* deep drawing process. Parts can be drawn of more intricate shape — having improved mechanical and physical values — in far fewer operations than common practice allows.

Tool costs run as low as 10% of conventional die set costs, making short-run production exceptionally economical. Trial parts are quickly produced. Tools can be readily modified to suit changes in part design. Different gages and types of materials can be tried, drawn on the same set of tools.

Hydroform tooling consists of the simplest elements of conventional tooling—a male punch and one draw ring. A built-in universal die member takes the place of the female die and the other parts of conventional tooling. Sheet materials, held between the punch and the universal die, are formed to the shape of the punch by *controlled* hydraulic pressure.

Investigate Hydroforming for your production. It will change your thinking on deep drawing and forming. The Cincinnati Milling Machine Company representative in your area will gladly give you detailed information. In addition, at the "Mill" in Cincinnati, a Hydroform laboratory is maintained where runs of sample parts are produced and where this revolutionary deep drawing principle can be demonstrated most effectively. Interested manufacturers are invited to inspect these facilities.

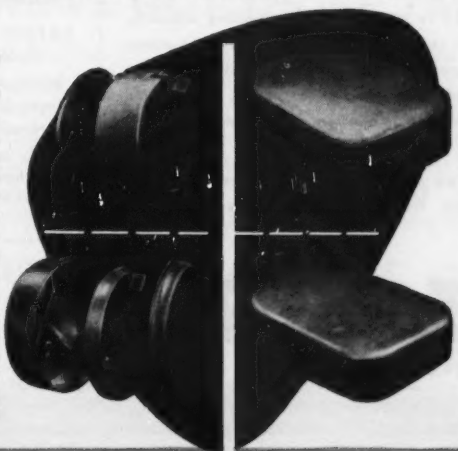
HERE'S WHAT HAPPENS WHEN HYDROFORMING ENTERS THE PRODUCTION PICTURE

ELECTRONIC INSTRUMENT CASE
0.040" Aluminum
FORMER METHOD Deep Drawn and Fabricated
12 Operations Total

Photo shows, in sequence form, the operations formerly required to produce this part. The shallow cover was drawn in 1 operation; the body required 2 draws, to sharpen the inside radius. The body was then notched to receive a plug receptacle, which was hand fabricated and welded in place.

HYDROFORM METHOD Deep Drawn
7 Operations Total

By re-designing the part to take advantage of Hydroforming capabilities, the part that was previously the cover became the body, produced complete with locating edge in 1 forming operation on a 12" Hydroform machine. The cover, with plug receptacle as an integral part, was formed in 2 operations.



GEAR CASE COVER, 16 ga. Steel
FORMER METHOD Fabricated
8 Operations Total

Previously produced, as photographed, in 2 sections, formed on a press brake. The sections were welded, ground and polished to remove excess weld material and re-shaped to fit the area to be covered.

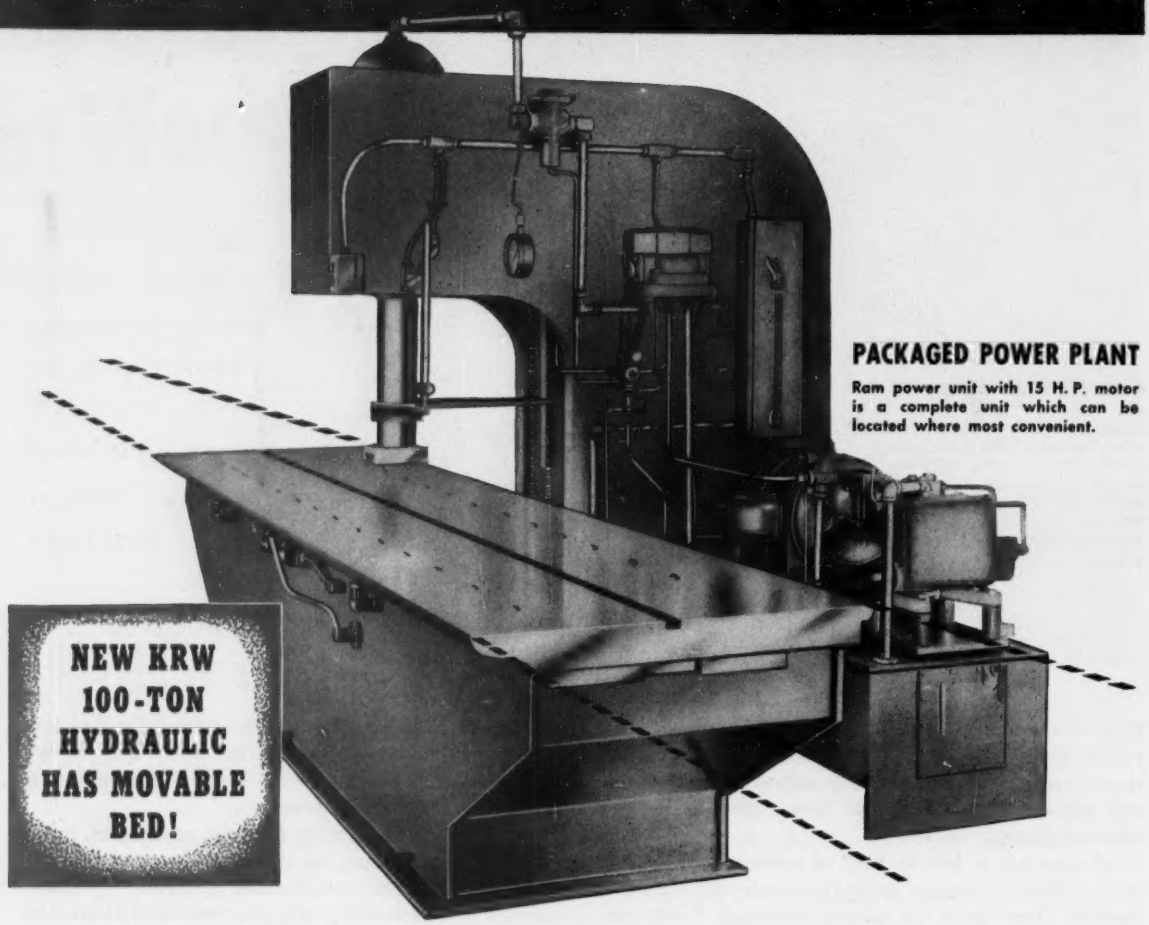
HYDROFORM METHOD Deep Drawn
3 Operations Total

The part is now Hydroformed complete in 1 draw, then trimmed. The photo at top of page shows the part being drawn on the 26" Hydroform. The saving in fabrication time alone paid for the cost of tools used to Hydroform this part, although less than 300 of these covers are required per year. The Hydroformed covers are held to close tolerance, eliminating a fitting problem that existed when these parts were fabricated.

CINCINNATI **Hydroform**

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO, U.S.A.

NEW PRESS BRINGS THE WORK TO YOU!



PACKAGED POWER PLANT

Ram power unit with 15 H. P. motor is a complete unit which can be located where most convenient.

NEW KRW 100-TON HYDRAULIC HAS MOVABLE BED!

Here's KRW's newest time-saver! It's a 100-ton Hydraulic Press with an extra-long 16 foot bed that moves more than 3 feet in either direction. Now being used for important straightening work by some of America's largest manufacturers of airplane forgings. Due to the extra-long movable bed, straightening work on large pieces can be accomplished with greater facility and speed. Ideal for manufacturers and fabricators of extra-long parts that require straightening work. Press bed has independent motor drive. Hydraulic motor doesn't have to be running to move the press bed back and forth.

This new KRW press has a unique load-control feature. An applied ram load can be maintained at any pressure setting from 10 to 100 tons without holding manually controlled lever at applied position. Operator can bring ram load to desired tonnage and remove hand from control lever. Lever automatically returns to neutral but applied load will be retained until manually controlled lever is moved to reverse position for lifting ram. This feature saves time on straightening jobs where it is necessary to hold a given pressure for periods of time.

KRW also makes a full line of one, two and three cylinder Hydraulic Presses; hand, air or motor driven; 25-150 ton capacities. Write for details and prices on this or any KRW Hydraulic to Dep't. 15.

SPECIFICATIONS

CONSTRUCTION Cylinder—chrome-nickel-molybdenum steel; C-frame and bed, weldment fabrication; Table, steel.

TABLE CONTROL Separate push buttons for right and left movement. Table stops when manually applied push button is released.

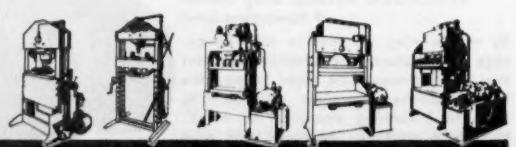
SAFETY PROVISIONS Electrical System—disconnect switches, automatic and manual.

Hydraulic System—pressure relief valves eliminate danger of overload in any part of the Hydraulic circuit.

Table and Ram travel is limited by safety switches. Manually adjustable stop limits up-travel of ram.

K·R·WILSON

215 MAIN ST., BUFFALO 3, N. Y.



Designers and Builders of the Right Hydraulic Press to Solve Your Metal-working Problems!

"YES...WE'VE GOT THOSE TAPS IN STOCK"

That's your INDUSTRIAL DISTRIBUTOR talking. Many a time, no doubt, you've heaved a sigh of relief when you've heard the welcome words, "Sure we've got 'em", or when you need service, "We'll send Jack right over".

And your GTD-GREENFIELD Distributor also has direct friendly contact at the factory with men he knows well, regarding non-stocked items or special tools.

Yes, it will pay you to get better acquainted with your GTD-GREENFIELD Distributor. Stop shopping around . . . stop buying the hard way.

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASS.

ONE AFTER ANOTHER

For years considered *the best* in a limited territory, AMPCO quality Drills and Reamers are now becoming favorites in an ever widening circle of friends. Now, from coast to coast, GTD-AMPCO Drills and Reamers are proving that what was long good in one section of American Industry is good the country over.

Yes, one drilling or reaming job after another is going GTD-AMPCO.

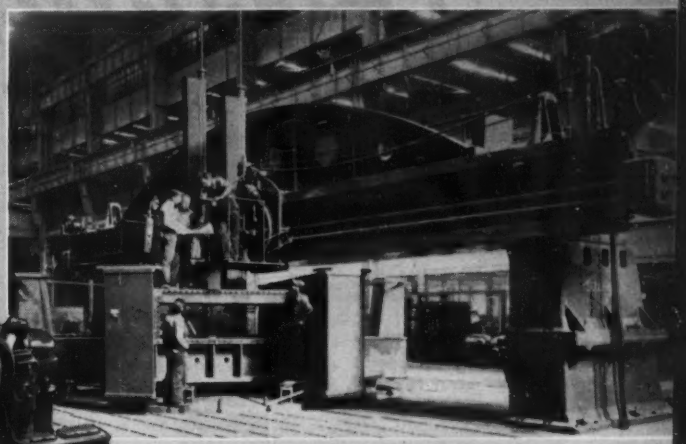
Get the best, specify GTD-AMPCO.

AMPCO TWIST DRILL DIVISION

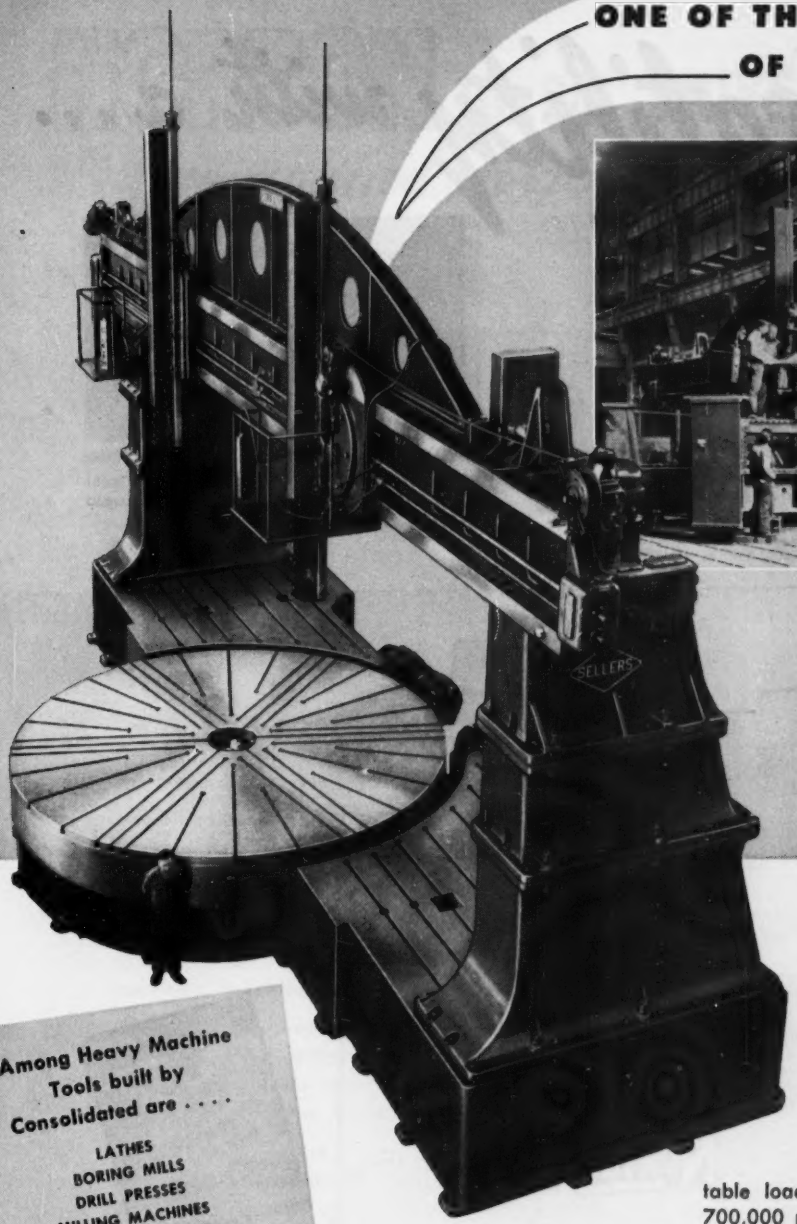
GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASS.

ONE OF THE BIGGEST MACHINES OF ITS TYPE EVER BUILT



BORING LOWER BEARING BRACKET OF A WATER WHEEL GENERATOR



SELLERS 42′ VERTICAL BORING AND TURNING MILL

This gigantic boring mill, built for one of the country's largest electrical companies, is one more example of the unusually big machines designed and produced by Consolidated. It swings work 42′-2″ in diameter and up to 14′ high. Maximum table load 240,000 pounds. Weight of machine 700,000 pounds. Overall height 42′, 10′ of which is below the floor level. Crossrail is 58′ long.

Among Heavy Machine Tools built by Consolidated are . . . .

- LATHES
- BORING MILLS
- DRILL PRESSES
- MILLING MACHINES
- BORING MACHINES
- COLD SAW MACHINES
- BORING, DRILLING AND MILLING MACHINES
- DRILL AND TOOL GRINDERS
- PLANERS
- SLOTTERS
- RAILROAD SHOP TOOLS
- AUTOMOTIVE TOOLS
- AND OTHER SPECIAL MACHINES

Other huge Consolidated Machines, recently built or in process, include a Betts Special Boring and Facing Machine, weighing 300,000 pounds, and a Sellers Combination Planer-Milling Machine, weight over 645,000 pounds; together with Betts-Bridgeford 96″ Geared Head Lathes, Sellers Horizontal Boring, Drilling and Milling Machines and Hilles & Jones Plate Edge Planers weighing 250,000, 275,000 and 120,000 pounds respectively. Whether your production problems demand big or standard type machines, Consolidated is prepared to meet your requirements.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

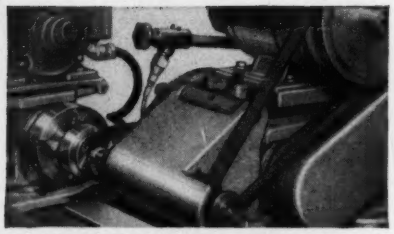
CONSOLIDATED
MACHINE TOOL CORPORATION

SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

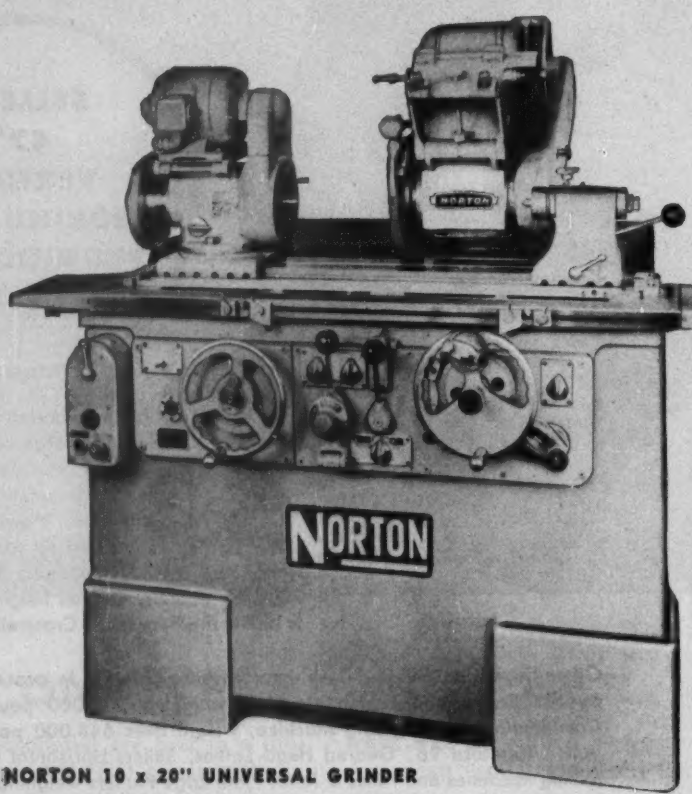
ROCHESTER, NEW YORK

Versatility with a...

EXCEPTIONALLY SMOOTH HYDRAULIC TRAVERSE with independent right and left-hand dwell control — automatic wheel feed at each reversal.



INDIVIDUALLY POWERED INTERNAL SPINDLE permanently hinged to front of wheel slide for maximum convenience and rapid set-ups.



NORTON 10 x 20" UNIVERSAL GRINDER

Additional features are described in Catalog 170. Write for your copy today.

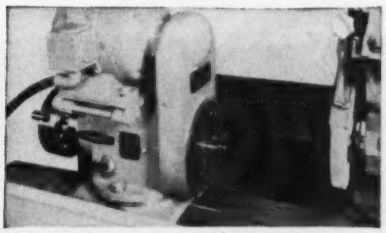
Making better products to make other products better

NORTON COMPANY, WORCESTER 6, MASS., U. S. A.

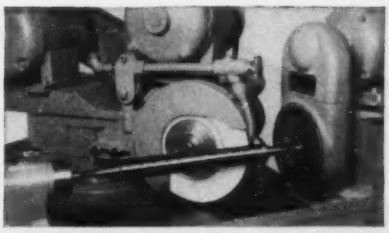
DISTRICT SALES OFFICES: HARTFORD • NEW YORK • CLEVELAND • CHICAGO • DETROIT

NORTON 10x20" UNIVERSAL GRINDER

simplified set-up . . . smooth performance



CONVENTIONAL or SPEED CHUCKS may be left permanently mounted on one end of headstock spindle. Headstock quickly swivelled 180° to bring chuck into position.



INTERCHANGEABILITY permits reversing head and footstock positions to eliminate necessity of changing wheel and drive to other end of spindle.

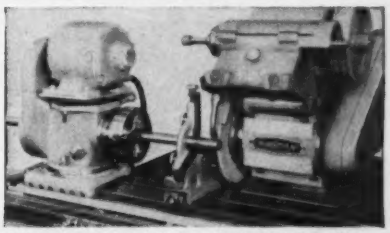
The **versatility** of the NORTON 10 x 20" Universal Grinder goes beyond efficient performance of external, internal, face, and angular wheel feed grinding.

Head and footstock positions are interchangeable permitting simplified set-up on jobs involving shoulders or spacers. Set-ups are made easier on chucking jobs by the D1-3" camlock nose on one end of the headstock spindle which permits permanent chuck mounting. The chuck is quickly positioned by swivelling the headstock.

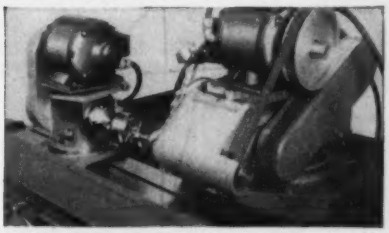
The headstock spindle is designed to take a workpiece up to 1" diameter clear through. This permits an extra long piece to be ground by chucking at one end and passing the remainder through.

For ease of set-up, the internal spindle is a hinged-bracket type, attached to the front of the wheel slide. This spindle is quickly swung into position for internal grinding — or is as quickly swung out of the way.

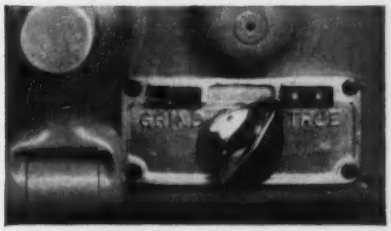
The wide versatility of this machine demonstrates again how you economize when you modernize with a new NORTON Machine.



HOLLOW SPINDLE in HEADSTOCK allows work up to 1" in diameter (and which is longer than machine) to be passed clear through.



COMPOUND WHEEL SLIDE permits swivelling of wheel head to any angle and wheel feed at any angle.



PRESET TRUING SPEED CONTROL enables table speed settings to remain undisturbed during truing. Independent right and left-hand dwell controls.

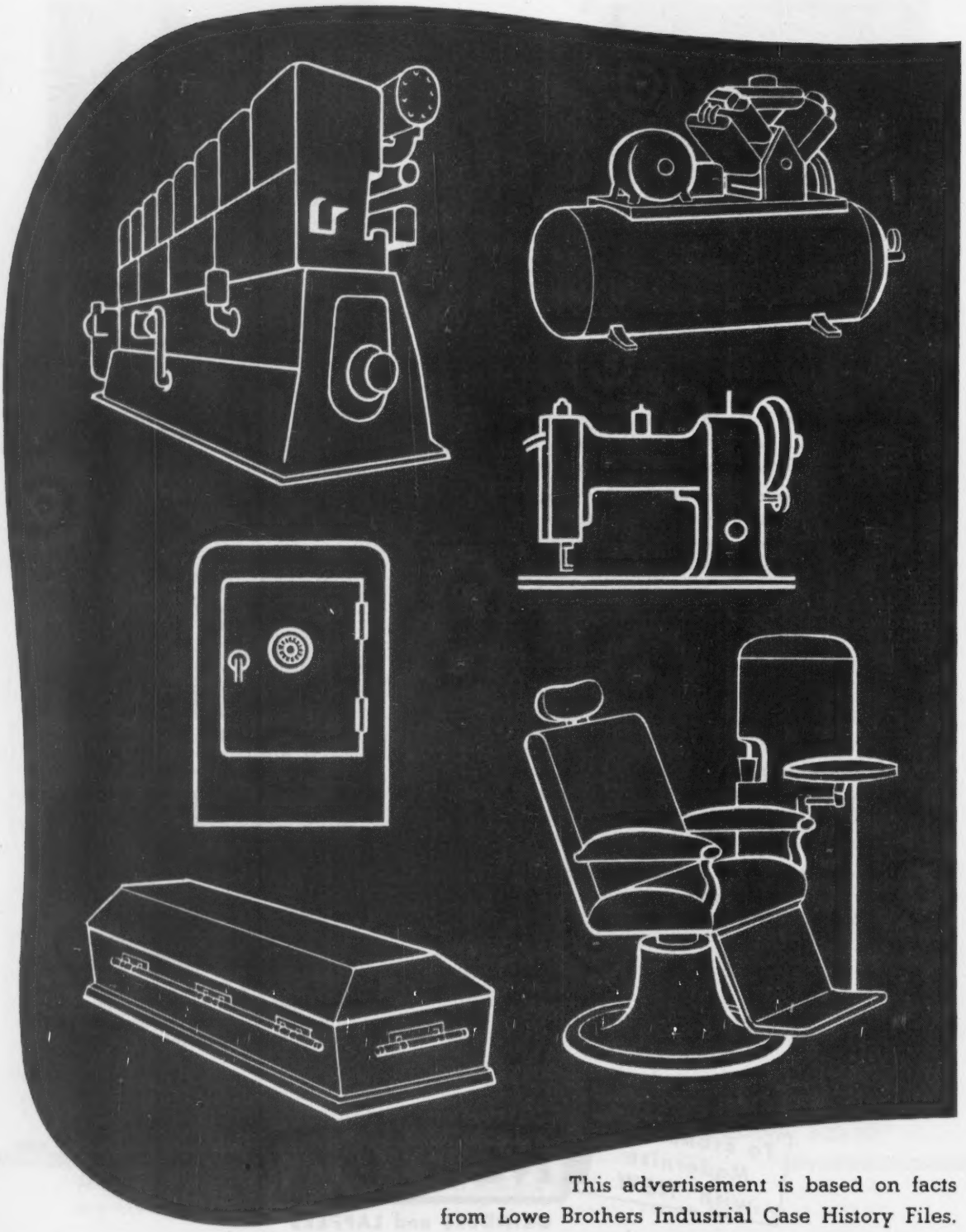
To Economize Modernize with NEW

NORTON

GRINDERS and LAPPERS

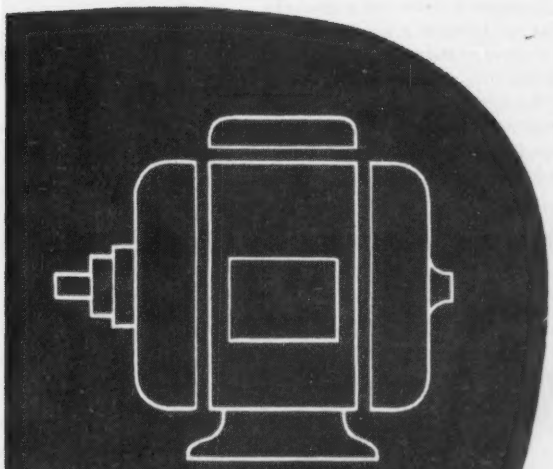
M608

Finishing time cut 50%...
...another



This advertisement is based on facts from Lowe Brothers Industrial Case History Files.

sanding eliminated entirely!
THERMO SPRAFIL true story



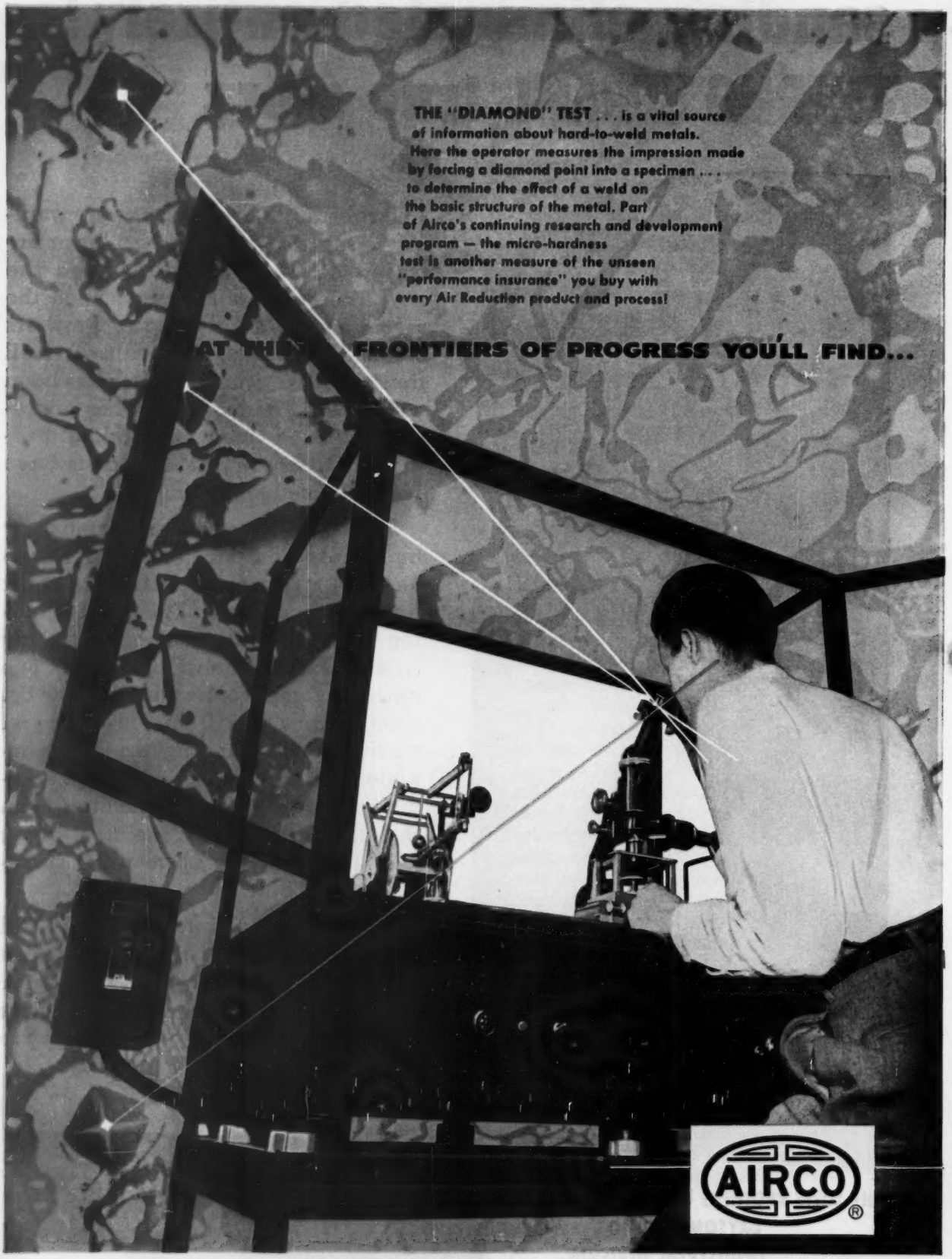
*Lowe Brothers Thermo Sprafil System puts new economy into the finishing of a wide variety of products including: motors . . . vaults & safes . . . diesel engines . . . dental equipment . . . sewing machines . . . metal caskets . . . air compressors . . . steam turbines . . . medical & hospital equipment . . . shoe machinery . . . laundry machinery . . . metal stitchers . . . beauty shop equipment . . . generators . . . electrical control panels . . . clothes pressing machinery . . . machine tools . . . many others!

A large motor* manufacturer, wanting to speed production and lower finishing costs, recently installed the new Thermo Sprafil system upon the recommendation of a Lowe Brothers "Finishing Specialist." Results: Overall finishing time on each motor has been cut in half! Thermo Sprafil has entirely eliminated need for sanding. Savings in labor and material costs have been effected accordingly.

Similar facts are being reported daily by other alert manufacturers who have put Thermo Sprafil into their finishing operations. They're all finding that it sprays on smoothly, evenly . . . air dries in 4 hours . . . bakes in one hour at temperatures up to 300° . . . always dries free from pin-holing . . . vastly reduces sanding time or completely eliminates need for it . . . provides a fine surface for finishing, even though the surface of the steel being used might not be up to usual standards of smoothness!

Why not check into Thermo Sprafil now? It may mean sizable savings in money and time for your particular finishing operation. A Lowe Brothers "Finishing Specialist" will be happy to discuss it with you. Write today.

THE LOWE BROTHERS COMPANY
DAYTON 2, OHIO
INDUSTRIAL DIVISION


THE "DIAMOND" TEST . . . is a vital source of information about hard-to-weld metals. Here the operator measures the impression made by forcing a diamond point into a specimen . . . to determine the effect of a weld on the basic structure of the metal. Part of Airco's continuing research and development program — the micro-hardness test is another measure of the unseen "performance insurance" you buy with every Air Reduction product and process!
FRONTIERS OF PROGRESS YOU'LL FIND...
AIRCO

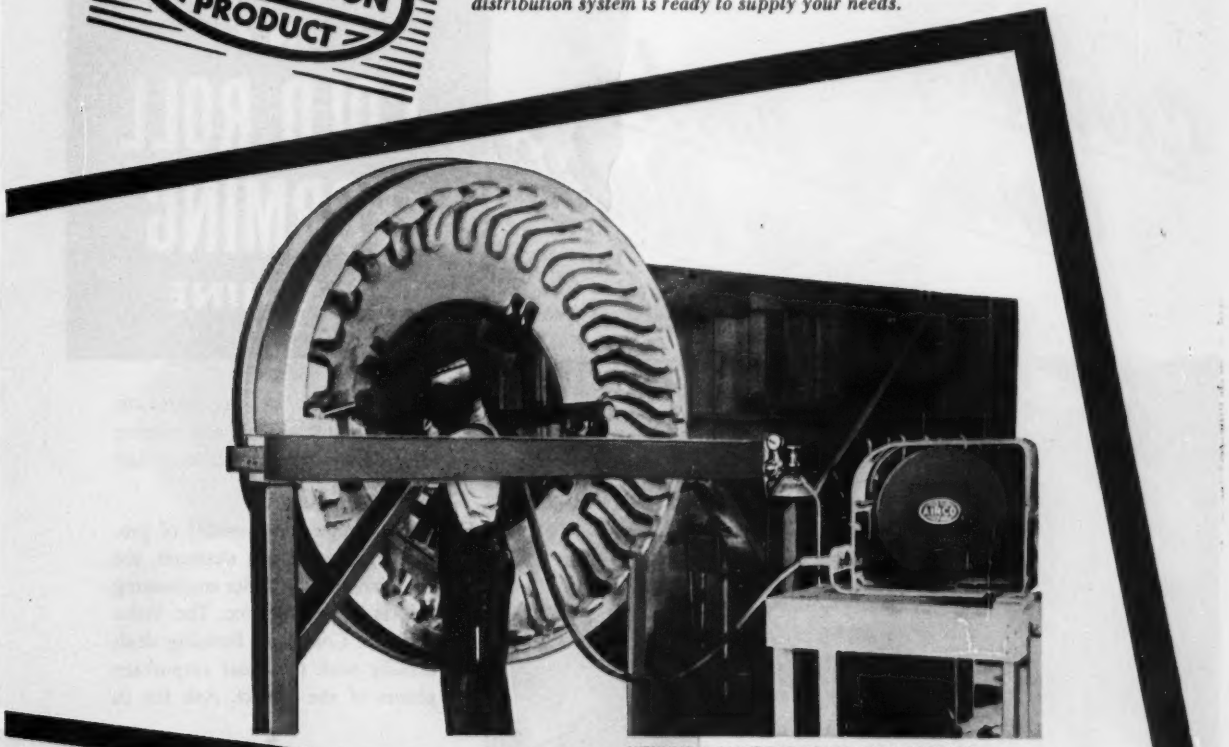
OXYGEN • ACETYLENE • INDUSTRIAL AND RARE GASES • CALCIUM CARBIDE • WELDING SUPPLIES AND ACCESSORIES

"welding" a perfect tread...

AIRCOMATIC® inert gas welding once again demonstrates its ability to handle problem metals in this unique application. A prominent manufacturer of aluminum molds for recapping tires ran into "tread trouble" when attempting to cast tread lugs into the doughnut-shaped tire matrix. Clearance between lug and matrix left an unsightly rubber "fin" on the finished product. The Aircomatic process eliminated this problem with clean, non-porous welds . . . at the same time speeding production through its high-rate deposition of filler metal. No flux was necessary . . . no slag removal . . . minimum "clean-up" on the finished matrix.

... AN AIR REDUCTION PRODUCT

And remember, when you need oxygen, acetylene, other industrial or rare gases, think of Air Reduction. A nation-wide distribution system is ready to supply your needs.



WELDING A GIANT TIRE MOLD WITH AIRCOMATIC

AIR REDUCTION

DEALERS AND OFFICES IN MANY PRINCIPAL CITIES

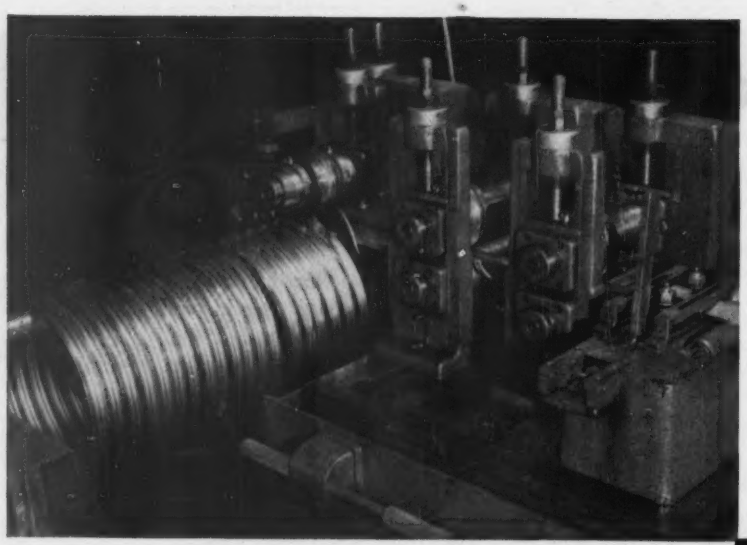
60 East 42nd Street • New York 17, N. Y.

Air Reduction Sales Co. • Air Reduction Magnolia Co. • Air Reduction Pacific Co.

Represented Internationally by Airco Company International

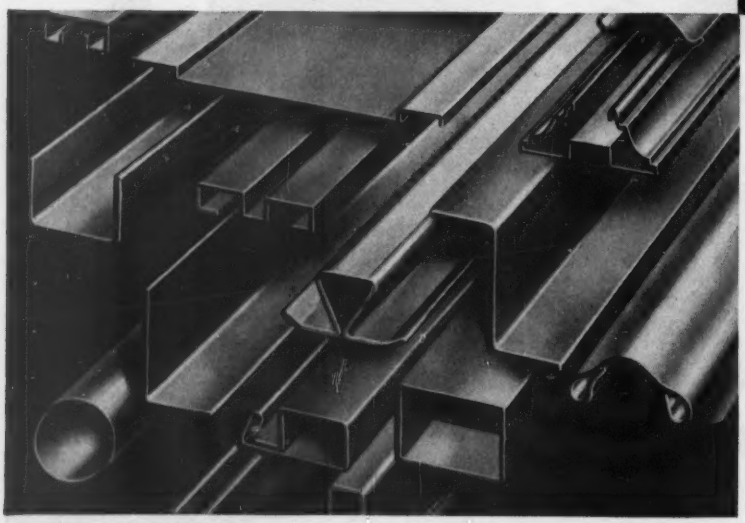
Divisions of Air Reduction Company, Incorporated

• OXYACETYLENE WELDING AND CUTTING APPARATUS • ARC WELDING AND INERT-GAS ARC WELDING EQUIPMENT



Curving Coiling and Ring Making

IN A COLD ROLL FORMING MACHINE



CURVING and coiling to almost any diameter, are two out of many operations which can be performed in a Yoder roll forming machine. As fast as formed, the sections can be continuously coiled and cut to length to make rings for auto hub caps, headlights, wheel trim, stator rings, etc., at a huge saving in cost of materials and labor.

Among other operations which can be tied in with cold roll forming may be mentioned embossing, notching, perforating, welding, flattening, lock-seaming, filling and closing tubular shapes, wrapping, edge trimming, etc.

In the design and assembly of production lines of this character, the know-how of the Yoder engineering staff is at your service. The Yoder book on Cold Roll Forming deals broadly with the most important phases of the subject. Ask for it.

•

THE YODER COMPANY
5504 Walworth Avenue
Cleveland 2, Ohio

Complete Production Lines

- ★ COLD-ROLL-FORMING and auxiliary machinery
- ★ GANG SLITTING LINES for Coils and Sheets
- ★ PIPE and TUBE MILLS–cold forming and welding

ENGINEERING YODER MANUFACTURING

UNION

Unretouched Photograph
by Morton Berger

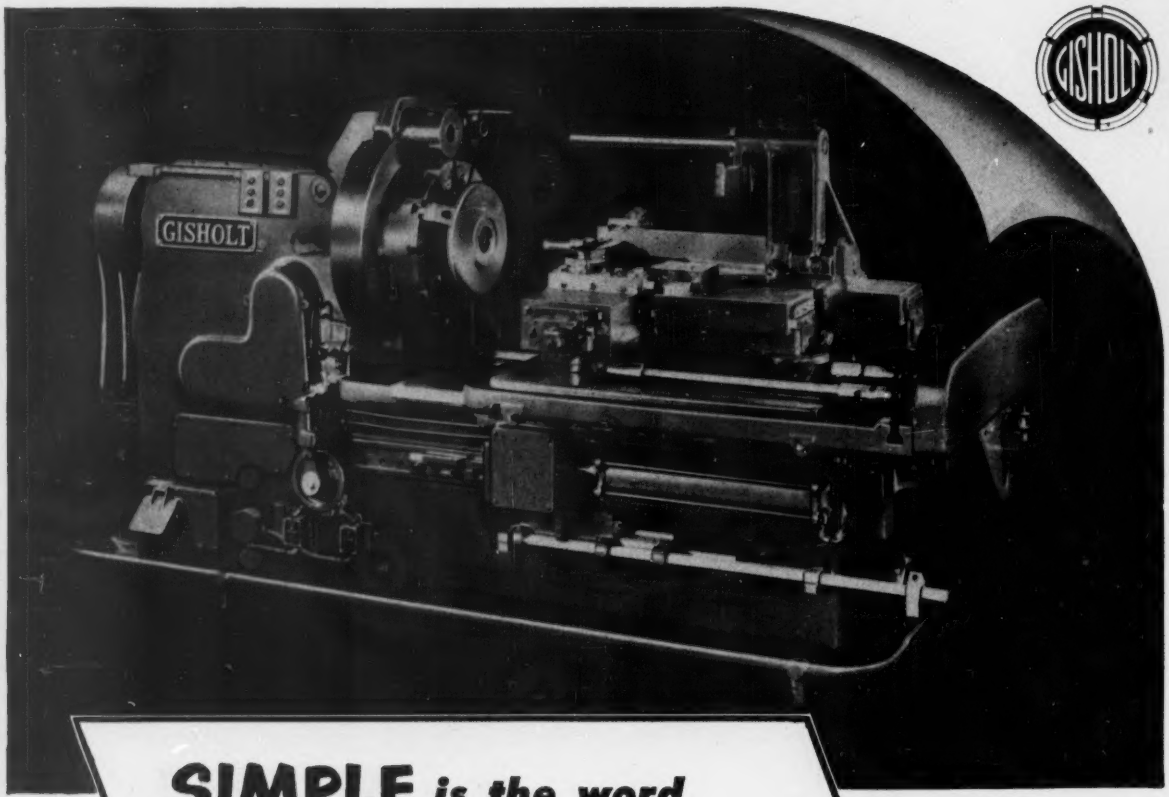
Perfectly designed for its job . . . .

Union's long experience in the cutting tool field reflects itself in the excellent performance of every tool it makes.

UNION TWIST DRILL COMPANY • ATHOL, MASSACHUSETTS

Milling Cutters **Gear Cutters** **Twist Drills** **Hobs** **Reamers** **Carbide Tools**

OWNERS AND OPERATORS OF: S. W. CARD MANUFACTURING CO. DIVISION, Mansfield, Mass. TAPS, DIES, SCREW PLATES
BUTTERFIELD DIVISION, Derby Line, Vermont DRILLS, TAPS, DIES, REAMERS, COUNTERBORES, SCREW PLATES
BUTTERFIELD DIVISION, Rock Island, Quebec MILLING CUTTERS, TWIST DRILLS, HOBS, REAMERS, TAPS, DIES, SCREW PLATES

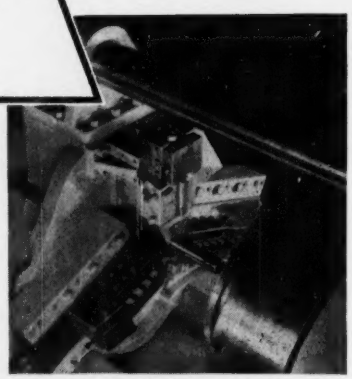


SIMPLE *is the word for the* SIMPLIMATIC!

Wherever you have a sufficient run of similar parts, the Simplimatic Automatic Lathe can solve several of your problems at once.

1. High speed production assures larger output at lower cost per piece.
2. The wide variety of tool arrangements on the large, flat table of the *Platen Type* Simplimatic (shown above) makes it adaptable to a wide range of work.
3. Training time is reduced to a minimum because the entire machining cycle is completely automatic. One operator normally runs several Simplimatics.

The extreme flexibility of the standard Simplimatic can frequently give you all the advantages of a machine designed especially for your job. If you want simple, quick, lower cost production, this is a good time to investigate the Gisholt Simplimatics. Ask for literature.



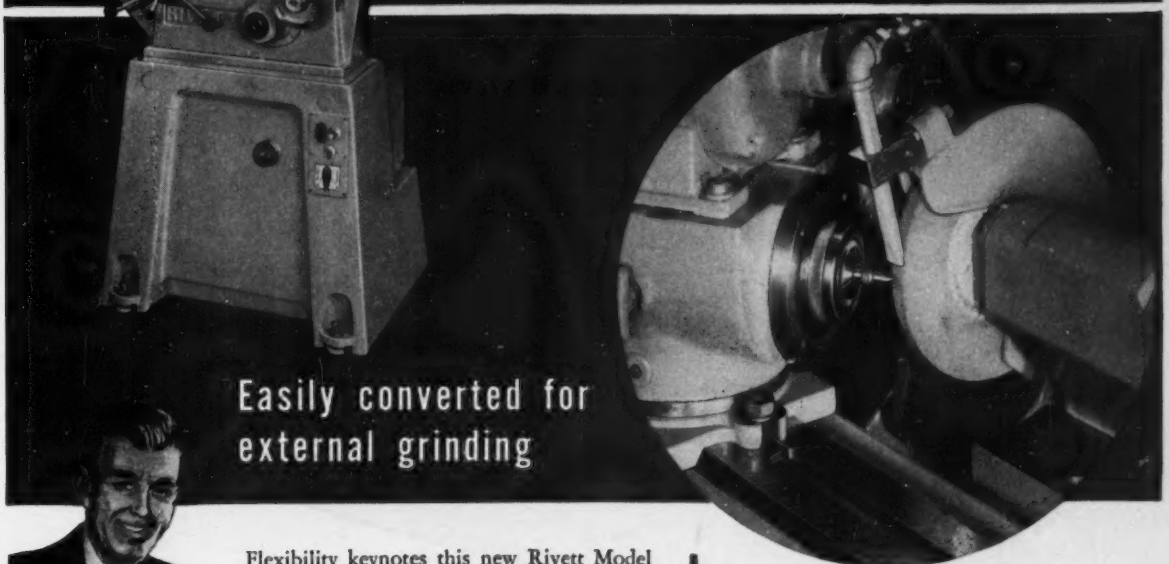
The *Radial Type* Simplimatic is ideal for machining flywheels, etc., with wide faces and multiple inside and outside diameters. Extreme rigidity permits multiple tooling and maximum cutting speeds, sustained accuracy and excellent life of cutting tools.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

TURRET LATHES · AUTOMATIC LATHES · SUPERFINISHERS · BALANCERS · SPECIAL MACHINES

A new small hole grinder



Flexibility keynotes this new Rivett Model 84. Primarily a small hole grinder, it may be equipped for external grinding. Simplicity reduces set-up time on the variety of work normal to the toolroom and die shop. Collets and step chucks quickly mount single or repetitive pieces.

The new Rivett 84 grinds holes from the smallest up to 3″ diameter, with a maximum 4″ depth depending upon diameter; external work to 3″ diameter by 4″ length.

If you need versatility with extreme accuracy, you will want to learn more about this new grinder. Send for Catalog 84.

FEATURES

- ★ Optional Wheelheads for internal and external spindles.
- ★ Internal Spindles 12,000 to 35,000 r.p.m.; sealed from grit and pre-lubricated for life.
- ★ Lathe-Type Workhead Spindle mounts draw-in collets and step chucks directly.
- ★ Micrometer Table Stop for positioning work when shoulder grinding.
- ★ Mechanical Power Table Travel with infinite adjustment of speed and stroke.
- ★ Hand Table Travel with coarse and fine feeds graduated to .001″.
- ★ Hand Infeed with coarse adjustment to .001″, and fine to .0001″ reduction of work diameter.

RIVETT **LATHE & GRINDER, Inc.**

Dept. MR-2, Brighton 35, Boston, Massachusetts

For More Precision Work RELY ON RIVETT LATHES AND GRINDERS, The Master Craftsman's Master Tools

NIAGARA

A NEW ALL STEEL

Write for Bulletin 89

versatility - high

BENDING • CURLING
FORMING • CORRUGATING
DRAWING • BLANKING
BEADING • EMBOSSING

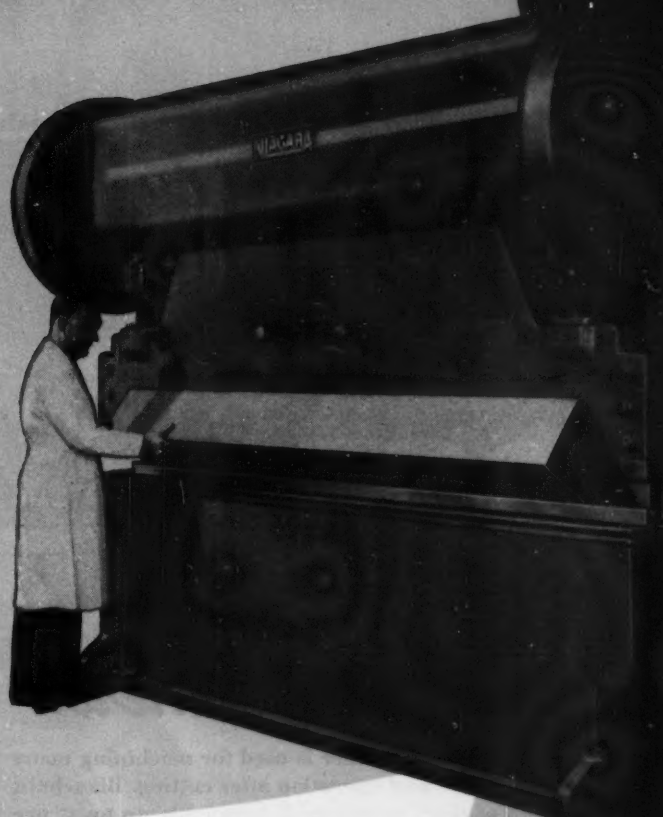
For Fabricating Sheet Metal and Light Plate

THESE HIGH SPEED PRESS BRAKES are perfectly suited for the smaller and lighter jobs that do not justify a large investment in equipment. They offer the advantages of big brake performance by incorporating features ordinarily found only in large expensive machines.

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

ANNOUNCES

LINE OF PRESS BRAKES



production - low cost

JOGGLING • PERFORATING
NOTCHING • SLITTING
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PIERCING • ETC.

For Fabricating Heavy Plate
(in addition to sheet metal)

THESE ULTRA MODERN, HEAVY DUTY PRESS BRAKES represent the ultimate in quality, stamina, and performance. They are built to the highest standards of accuracy and workmanship for peak production under the most severe conditions.

America's Most Complete Line of Presses, Shears, Machines and Tools for Sheet Metal Work

DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK • PHILADELPHIA

Dealers in principal U. S. cities and major foreign countries

Takes on all comers!

This 42-72-84 Blanchard Surface Grinder is used for machining many sizes of torch cut steel plates. As the first operation after cutting, Blanchard grinding removes the proper depth of stock as required, frequently up to ⅛" per side, producing surfaces accurately flat and parallel for laying out or further machining. Work up to 7 feet across corners is regularly ground on this machine. In spite of its size, this grinder is as easily controlled as the smaller Blanchard grinders.

Typical of work produced is the 48" x 48" x 10" machine steel, die mounting plate, at left. 58 cu. in. of stock (.025" per side) is ground off in one hour and 35 minutes, floor to floor, with flatness held to .001". Note the magnetic hoist —a good tip for loading and unloading the Blanchard quickly.

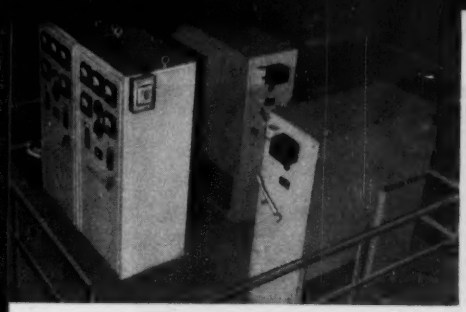
Regardless of your requirements for stock removal, tolerances or surface finish, Blanchard has the grinder and grinding wheel to do each job best.

Send for your free copies of "Work Done on the Blanchard," fourth edition, and "Art of Blanchard Surface Grinding."

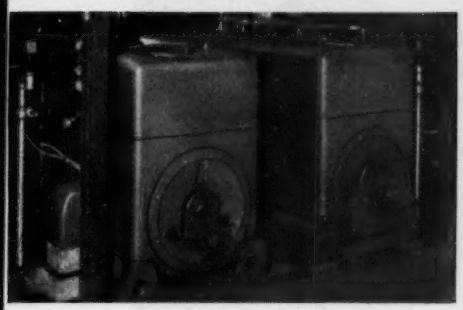
PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.



1 G-E induction heating, with controls mounted above the motor-generators, saves plant space at the forging machines



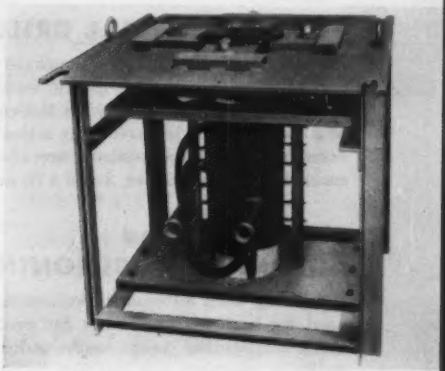
2 Power for heating is instantly ready from these 3000-cycle units. Enclosed construction permits location right at the job.

3 Only the portion to be upset is heated, saving power and minimizing radiation. Heating time for each end of these truck axle housings at Clark Equipment Co., Buchanan, Mich., is only 55 seconds.

Why You Should Use Induction Heat for Forging

4 Only two induction heaters supply heated housings for a production rate of one housing every 30 seconds from this upsetter.

5 Different sizes of housings are accommodated by an easy change of the inductor coil assembly.



6 With G-E induction heat, minimum scale is formed, and therefore *die life is increased.*

LEARN MORE about how G-E induction heating equipment can do selective heating for heavy jobs like these axles. Call the nearby G-E Sales Office for the Industrial Heating Specialist . . . an expert on applying induction heating equipment. For bulletin GEA-5679, EQUIPMENT FOR INDUCTION HEATING—1, 3, 10 kilocycles, send in this coupon.

( ) for immediate project ( ) for reference

Sect. C 720-96, General Electric Co., Schenectady 5, N. Y.

Name .....

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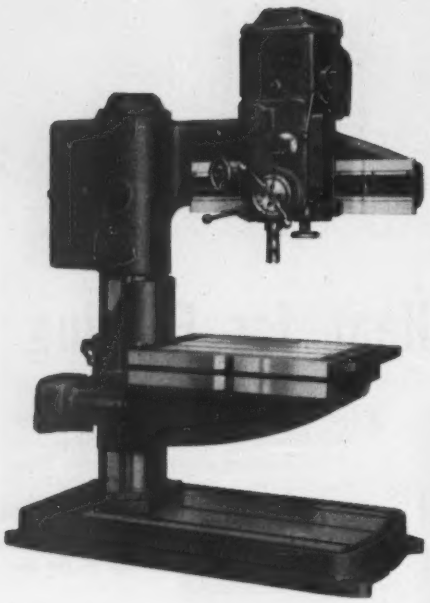
GENERAL ELECTRIC

FOSDICK

precision

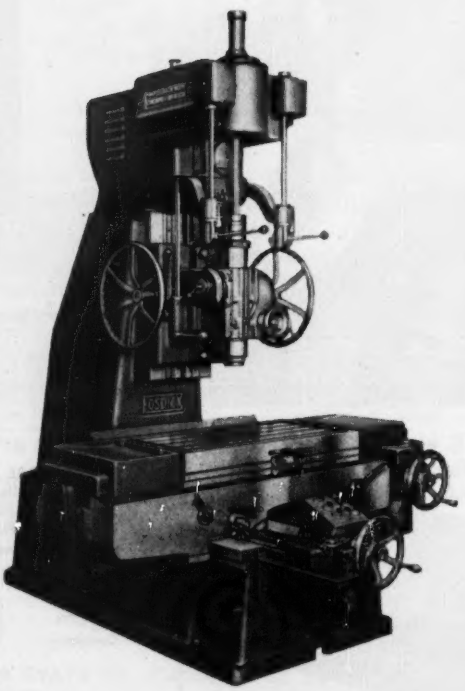
positioned holes

production



SENSITIVE RADIAL DRILL

Exclusive with Fosdick, the Sensitive Radial combines upright and sensitive features—rigidity, compactness and convenient table height—with the capacity and flexibility of a radial. Table is universally adjustable, arm rotates at constant height and controls are always within convenient reach. One piece column, 3 and 4 ft. arms. Drills up to 1¼ ″.



JIG BORER and AUTOMATIC POSITIONING MACHINE

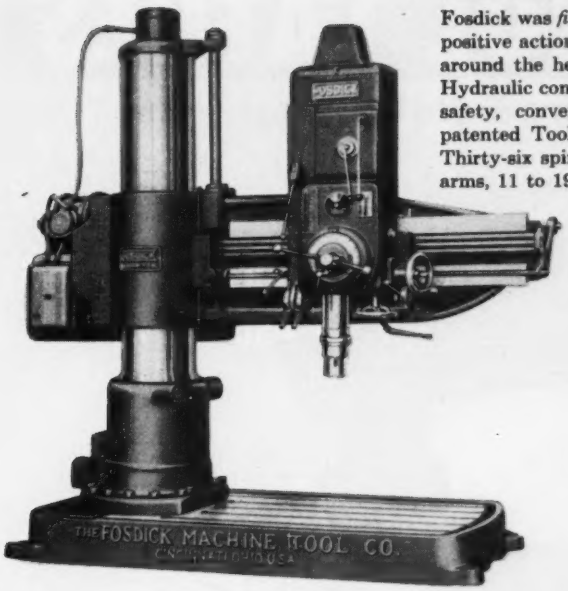
Jig boring with automatic positioning has eliminated the need for highly-skilled labor for precision hole positioning! With duplicating bars—made quickly, stored easily—the ordinary operator can position table and slide at the same time to within plus or minus .0001″ *at the touch of a button!* And Fosdick's Jig Borer costs less than any comparable machine on the market.

Duplicating drilled, bored and tapped parts—*weeks, months* or *years* apart—is fast, economical with Fosdick's Automatic Positioning machine. Set up time measured in minutes! Costly jigs are replaced by compact duplicating bars made of standard ½″ stock, bored for each hole.

Table sizes: 18″x36″ (no automatic positioning) and 22″x44″. Table to spindle capacity, 27″. 3 hp motor standard, 5 or 7½ hp optional.

ECONOMAX HYDRAULIC RADIAL DRILL

Fosdick was *first* to use hydraulics in a radial for smooth, positive action, easy operation. Controls are grouped around the head for maximum operator efficiency. Hydraulic controls and clamps are interlocked for safety, convenience. Standard equipment includes patented Tool Ejector and built-in fluorescent tube. Thirty-six spindle speeds, eighteen feeds. 3 to 8 ft. arms, 11 to 19 inch columns.



UPRIGHT DRILL

Two sizes, 25″ and 30″ with either round or box columns. Twelve spindle speeds from 60 to 1500 rpm, nine power feeds from .005″ to .043″ per revolution.

SENSITIVE DRILLS

For economical production of small drilled parts. 1 to 6 spindles in either six or nine speeds from as low as 55 rpm to as high as 3600 rpm, four power feeds.

Mail this coupon today!

FOSDICK

The Fosdick Machine Tool Co., Dept. M, Cincinnati 23

Please send descriptive bulletins for the following machines:

- ☐ *Sensitive Radial*
- ☐ *Automatic Positioning Machine*
- ☐ *Economax Radial*
- ☐ *Sensitive Drill*
- ☐ *Jig Borer*
- ☐ *Upright Drill*

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Individual _____

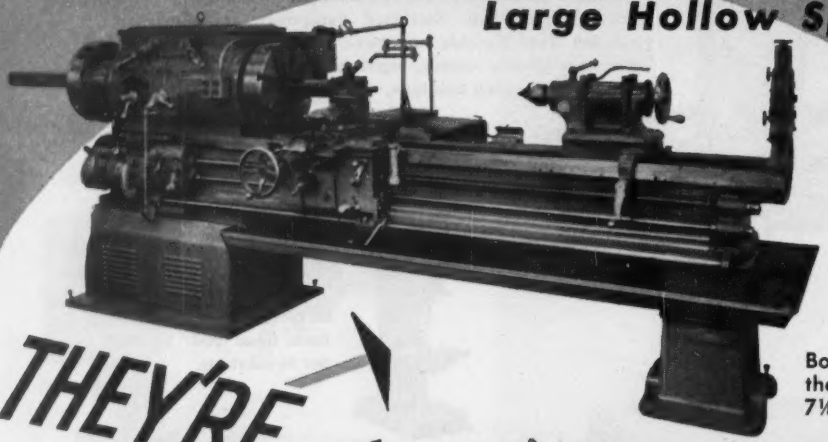
Title _____

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

FOR FASTER PRODUCTION, BETTER WORK, LOWER COSTS—

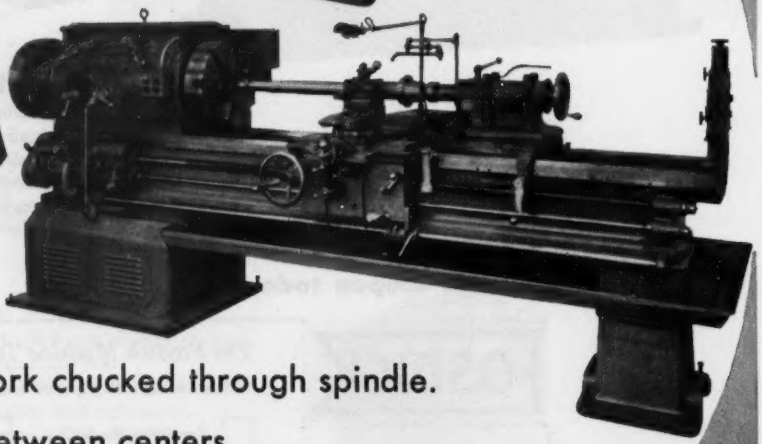
HYDRATROL LATHES

Large Hollow Spindle Type



Both Illustrations Show the 18" Hollow Spindle 7⅛" Hole

THEY'RE VERSATILE!



- Machine long work chucked through spindle.
- Machine work between centers.
- Also built with beds and carriages on each end of headstock for machining both ends of a shaft at one time.

SIZES 18" TO 36"

Small — 18" & 20" up to 7⅛" Hole
Medium — 25" up to 12" Hole
Large — 32" & 36" up to 16⅛" Hole
(Standard Type Lathes 16"-36")

IMPORTANT FEATURES

Timken Bearing Spindles.

Hydraulic clutches for forward and reverse, controlled from apron or headstock.

Hydraulic brake for close position control.

Hydraulic clutches self-compensating. No adjustment and full power capacity at all times.

LEHMANN MACHINE COMPANY

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Get more production with

MO-MAX and MO-MAX Cobalt

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TOUGH • RUGGED • DURABLE
GROUND FOR UNIFORM HARDNESS

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Are high capacity and long service life important?

here's how truck and trailer manufacturers get them with NEEDLE BEARINGS

Many leading truck and trailer manufacturers specify Torrington Needle Bearings for steering and brake assemblies because of their high radial load capacity and their long service life.

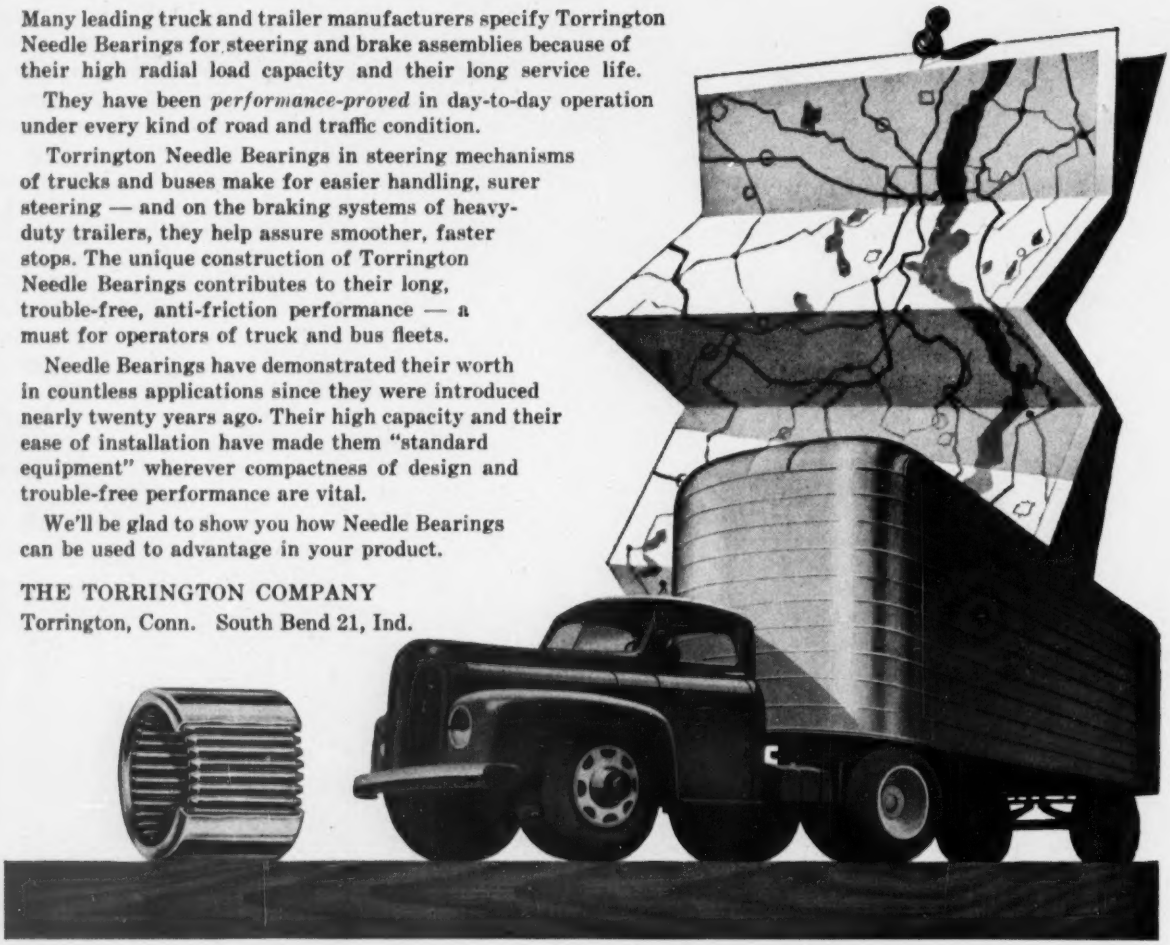
They have been *performance-proved* in day-to-day operation under every kind of road and traffic condition.

Torrington Needle Bearings in steering mechanisms of trucks and buses make for easier handling, surer steering — and on the braking systems of heavy-duty trailers, they help assure smoother, faster stops. The unique construction of Torrington Needle Bearings contributes to their long, trouble-free, anti-friction performance — a must for operators of truck and bus fleets.

Needle Bearings have demonstrated their worth in countless applications since they were introduced nearly twenty years ago. Their high capacity and their ease of installation have made them "standard equipment" wherever compactness of design and trouble-free performance are vital.

We'll be glad to show you how Needle Bearings can be used to advantage in your product.

THE TORRINGTON COMPANY
Torrington, Conn. South Bend 21, Ind.



TORRINGTON *NEEDLE* **BEARINGS**

Needle • Spherical Roller • Tapered Roller • Straight Roller • Ball • Needle Rollers

Trade-marks of some of the truck and trailer manufacturers whose products enjoy the benefits of Needle Bearings.

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an ACCO product

CAMPBELL ABRASIVE CUTTERS

Model 406 Abrasive Cutter

Fast, Low Cost Cuts

● Cutting any type of material by the CAMPBELL Abrasive method produces high quality parts with excellent finish and dimensional accuracy, often saving subsequent operations. CAMPBELL machines control heat in both work and cutting wheel. Wheel is entirely enclosed in safety guard. Many models are available. Ask for *"Principles of Abrasive Cutting."*

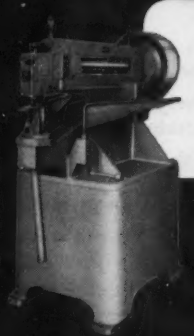
Tell us your cutting problem and we'll make recommendations.

Model 223 Abrasive Cutter

Model 15 Abrasive Cutter

and CAMPBELL NIBBLERS

● The modern way to cut sheet metal to any desired shape. High speed, variable stroke. Quick and inexpensive. Literature will be sent on request.



Model 2524 Nibbler

ACCO

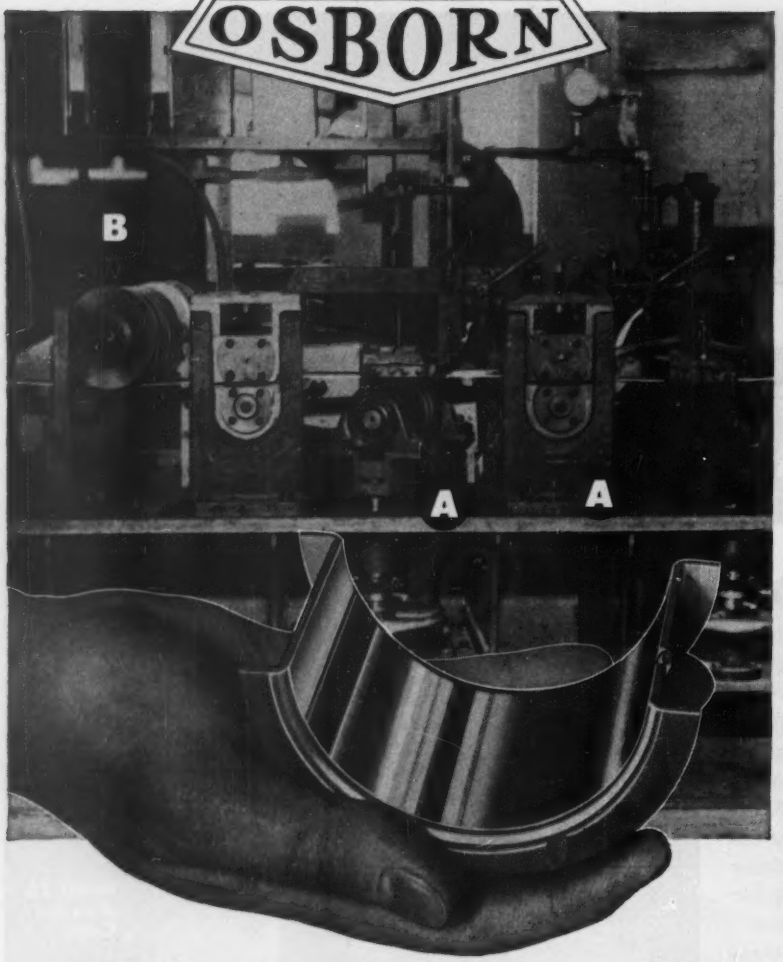
TRADE MARK

CAMPBELL MACHINE DIVISION
AMERICAN CHAIN & CABLE

925 Connecticut Ave., Bridgeport 2, Conn.

CAMPBELL Abrasive Cutters and Nibblers

OSBORN



Will "automatic" ideas like these cut your costs?

THIS machine does two jobs at one time . . . does them thoroughly by power brushing . . . at the push of a button.

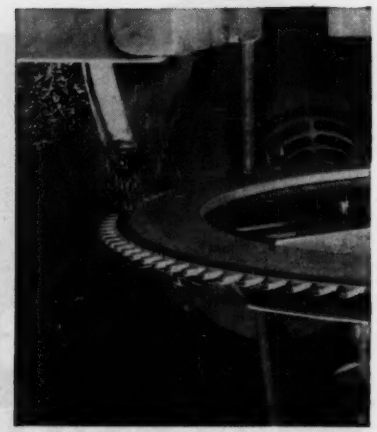
Perhaps a similar brushing method can help cut *your* costs, boost *your* production and improve the quality of *your* products.

The machine developed with the help of the **O**sborn **B**rushing **A**nalyst cleans steel-backed, babbitt-lined strip for production of automotive sleeve bearings. With the strip traveling continuously, Osborn Master® Wheel Brushes (A) remove all dirt, rust and metal particles from the steel surface. Osborn Monarch® Sections (B) then thoroughly clean the babbitt side.

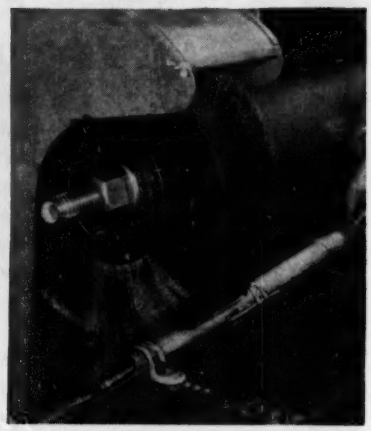
This is typical of the cooperation which your **O**sborn **B**rushing **A**nalyst can give *you* to solve problems of product cleaning, burr removal, roughing, polishing and finishing. For help, call or write *The Osborn Manufacturing Company, Dept. D-2, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

Osborn Brushes

OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES

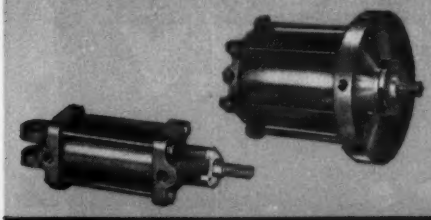


SAVES 12 MEN. This is one station of a five-station rotary automatic machine equipped with Osborn power brushes that removes burrs and sharp corners of clutch disc teeth. Formerly done by hand. Saves 12 skilled men.



9 TIMES AS FAST. This simple pipe fixture provides the means of cleaning threads of set screws. Can be applied to many cylindrical parts. Time was cut from 18 seconds to 2 seconds with this Osborn brushing idea.

10 TIMES AS FAST. This shows two gears before and after deburring by a new Osborn power brushing method. Note smooth uniform results. Time was cut from 3 minutes to 18 seconds.



Pneumatic Cylinders

Really complete, the Hannifin line of pneumatic cylinders is made with two types of pistons . . . bores from 1″ to 16″ . . . six standard mountings. Really standard, these cylinders are tooled to tolerances that assure accurate mounting to make assembly to your machines easier. Really built, each cylinder is "TRU-BORED" and honed, piston rods are ground and polished, interchangeable end caps, heavy duty tie rods . . . rugged, yet precision construction throughout!

Write for Bulletin 210

NOW...

HANNIFIN HAS THE MOST COMPLETE LINE OF AIR CONTROL EQUIPMENT!

NEW! REVOLUTIONARY HANNIFIN *P-M Pilot-Master Valves*

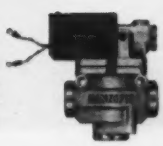
Piston-operated poppet design. Exclusive replaceable cartridge for easier maintenance. Speeds to 600 cycles per minute. Pressure from 15 to 150 p.s.i. Integral, solenoid-controlled pilot heads or a choice of 10 separate pilot valves for remote control.

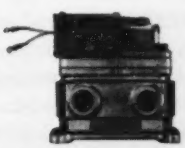
- Fewer Valves to Stock
- Fewer Parts to Stock
- Maximum Interchangeability
- No Springs in Main Valve

Write for Bulletin 231.

2 and 3-Way Valves.

Same valve operates 2-way or 3-way, normally open or normally closed. ⅜″ to 1¼″ I.P.S.

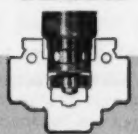




4-Way Valves.

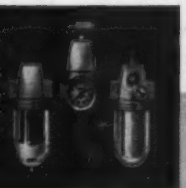
Two 3-way valves mounted in compact, common body. Two piston poppets. Two cartridges. ⅜″, ½″, ¾″ I.P.S.

EXCLUSIVE REPLACEABLE CARTRIDGE



AIR WARDEN

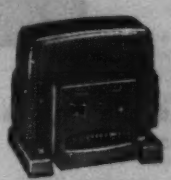
Air filters, pressure regulators and lubricators to protect air operated equipment. Bulletin 10108.



Disc Type Air Control Valves

Designed for smooth, positive and accurate control of air-operated equipment. Bronze discs lapped to perfect seal with seats. Packless design. For hand, foot or electrical operation. Sizes: ⅛″ to 1¼″ I.P.S.

Write for Bulletin 57-W



Hannifin "Directair" electrically controlled air-operated disc valve

Foot-operated treadle valve (Also spring return and rotary types)

Standard hand control valve (Single or duplex)

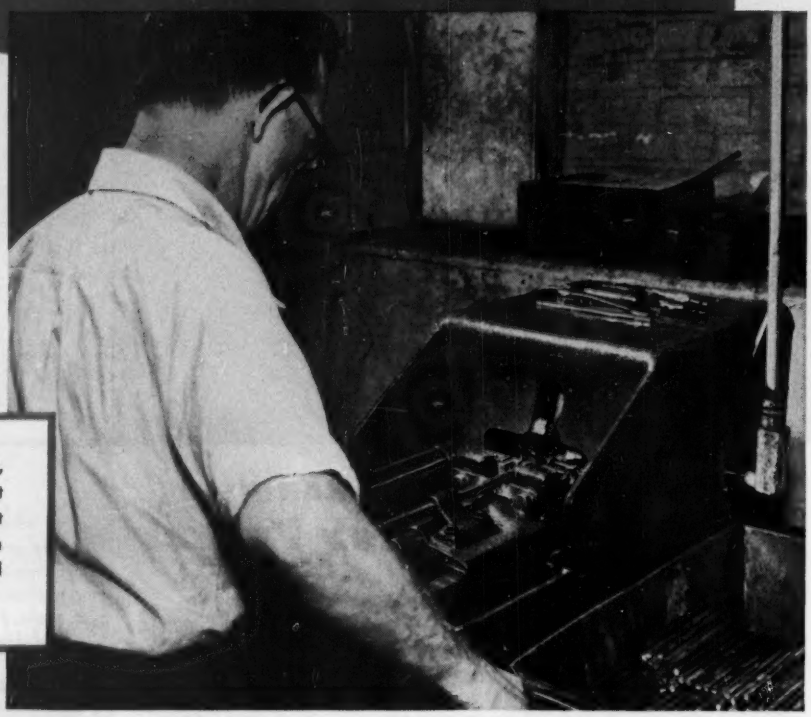
HANNIFIN

Hannifin Corporation, 1109 S. Kilbourn Ave., Chicago 24, Ill.

Air and Hydraulic Cylinders • Hydraulic Power Units • Pneumatic and Hydraulic Presses • Air Control Valves

TOOL LIFE GREATLY INCREASED . . .

for Rockford Bolt and Steel Company, Rockford, Ill.



. . . since changing to TEXACO TRANSULTEX CUTTING OIL

Number 1018 Bright Basic Wire, 5/16" in diameter, is threaded at both ends with 18-pitch threads cut to a Class 2 fit. Threads are cut from 5/8" to 1-1/8" up from ends. Steel Hardness 165-210 Brinnel.

THE JOB: Cutting threads on studs with Landis Threader. (See box for details.)

THE CUTTING FLUID: *Texaco Transultex Cutting Oil* — the transparent cutting oil that does an outstanding job on heavy-duty work. Active sulfur and other extreme pressure additives, plus an effective wetting agent, assure fine cutting characteristics that give uniform performance even in prolonged heavy-duty service. *Texaco Transultex Cutting Oil* also has good odor characteristics.

THE RESULTS: Production is 650 to 700 ends per hour—a substantial increase over output with previous oil used. It is not unusual for threading dies to be ground only once a week.

Let a Texaco Lubrication Engineer show you how *Texaco Cutting, Grinding and Soluble Oils* can help you do *all* your machining better, faster and at lower cost. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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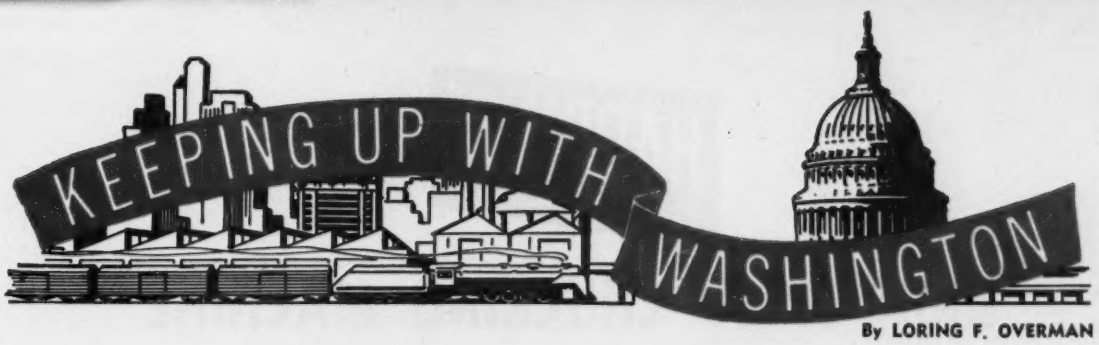

By LORING F. OVERMAN

The New Administration Is Getting Started

AT the turn of the year, a hundred or so persons close to the official family of the President-elect were beginning to see things take shape out of the mists of speculation. A new pattern of defense spending began to emerge, its peak deferred until late 1953 instead of coming in the second quarter of the year, as previously estimated. The placing of emphasis upon broadening "the mobilization base" was resulting in some interesting prospects in the machinery field. Forecasts were silencing rumors that the facilities base might already be overexpanded. The likelihood of a second look at the controls program, which many had assumed would be discarded posthaste, was conceded. Those hopeful of reducing taxes were faced with problems.

Spending Pattern

If present schedules hold, total spending for military and military aid would be $52,400,000,000 in fiscal 1954, as compared with probable outlays of $48,800,000,000 in fiscal 1953, which ends June 30. Non-security outlays probably will be reduced. The net effect may be total budget expenditures of $77,600,000,000 during the fiscal year ending June 30, 1954, as compared with probable outlays of $76,000,000,000 during the 1953 fiscal year ending June 30.

There is little reason to assume that today's estimate of production peaks will be any more accurate than those of the past. But with Charles E. Wilson and a staff of production men at the helm of the defense program, all signs point toward more production rather than less.

Continuing in popularity is the broadened mobilization base idea—a projection of needs for facilities, rather than the stockpiling of end items. There was the mid-December announcement of an expansion goal for big machine tools. These machines are included in the heavy press programs of the Air Force and the Atomic Energy Commission, and in the Navy's program of large ship components, including reduction gears, propellers, and turbines. Machine tools needed for these programs weigh from 250,000 to 450,000 pounds each, with production costs estimated at somewhat more than one dollar per pound. This expansion goal is scheduled to be attained by January 1, 1954. It is in addition to previously announced goals for the production of machine tools of the more orthodox types.

Overexpansion?

Disregarding facilities to produce military specialities exclusively, there is the question as to whether the present production equipment base is dangerously overexpanded. The Congressional Joint Economic Committee, in a year-end report, sees no grounds for such fears. Although not attempting to predict year-by-year trends, the report indicates that present expansion of facilities is little more than should be expected.

"What appear from the 1946 to 1952 statistics to have been 'abnormally' high years for private investment," says the report, "turn out to have done little more than to bring us up to levels which might have been expected under a rate of progress uninterrupted by depression and wartime restrictions.

"If one is willing to take as evidence the long-run growth trend curves alone, it appears that businessmen might safely expect to continue current rates of private plant and equipment outlays, and even increase them substantially over the years, without serious risk of overexpansion. If there is any such overcapacity, the probabilities are that the country will have grown up to the needs before the 'excesses' get to be an economic problem."

Controls Seem Inevitable

Business and manufacturer groups in Washington are passing around the word that Congress will take a studied look at economic controls before yielding to pressure to end them. All have been told to look forward to the continuation of some sort of controls. Business spokesmen take a dim view of the idea that there can be stand-by controls and dummy agencies to impose them when needed.

The inevitability of controls of some sort is pointed up by the expressed viewpoints of two who are known to be foes of direct controls—Senator Capehart (Republican, Indiana) and Representative Jesse P. Wolcott (Republican, Michigan). Representative Wolcott, who will head the House Banking Committee, is not letting his personal views dictate his official position. He has indicated that the wishes of the new President must first be taken into consideration, and that public hearings will permit a thorough airing of the problems. Senator Capehart, chairman of the Senate Banking Committee, has announced a similar view.

Taxes Difficult to Reduce

In its party platform and in the speeches of its candidates, the new Administration promised to halt the tide of government spending as quickly as possible, to reduce taxes, to reduce waste and extravagance, to halt the trend toward centralization in Washington, and to encourage private initiative.

Some contend that the spending pattern has been established, and that little can be done toward cutting taxes. Others believe that it should be possible to squeeze billions of dollars in "fat and water" out of some of the existing programs, without impairing either government efficiency or military might. Among the tax-saving opportunities being eyed by the congressional economy bloc are:

Military appropriations — which will undergo close scrutiny, particularly with regard to value received.

Foreign aid funds—where many feel that the time has come to put a stop to lavishness.

Public power and river developments—wherein economizers see opportunity to encourage investment.

Pet domestic programs—many of which will have to be justified.

Views of the machinery industry on taxes have been presented to the Joint Congressional Committee on Internal Revenue Taxation in a brief entitled, "How to Improve Federal Tax Policy." The brief, presented by the Machinery and Allied Products Institute, is now under study by the Committee. While the Committee is holding its deliberations would be a good time for individual industrialists to write or talk to members of Congress.

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Civil Defense is "Life Insurance" for Industry

MANY manufacturing concerns have been in business for generations without ever having experienced a serious fire. Yet what general manager would be so foolhardy as to dispense with fire insurance on any of the properties that are under his supervision?

An analogy exists today in the matter of civil defense. A sudden bombing attack on our industrial centers, we devoutly hope, is a remote possibility. However, as long as powerful potential enemies do exist, it is merely common sense to be prepared for any calamitous happening.

Since modern wars are won by the nations that have the greatest productive capacity with which to back up their fighting men, a third World War, should it come, would unquestionably be directed at the very start against America's industrial production centers. Prudent managements of business enterprises will therefore take out insurance against such a contingency in the form of civil defense measures. A substantial number of industrial plants have already taken adequate steps for shop protection. In instances where protective measures have not been adopted, quick action is urged.

Such action on the part of sagacious businessmen will not increase the likelihood of a bomb attack any more than the taking out of fire insurance increases the danger of conflagration. On the contrary, the more efficient our industrial civil defense becomes, the less tempting the target will be.

Well organized civil defense could render any sneak attack on American industry far less effective than if we were caught unawares. It could reduce casualties, stop fires before they got out of control, restore damaged facilities, and make it possible for production to resume with a minimum loss in time. Efficient civil defense, therefore, would yield dividends in human lives saved, enable a manufacturing concern to continue its part in national defense with maximum efficiency, and reduce plant and equipment damage to a minimum. Perhaps the greatest dividends would be in the saving of lives because the loss of a single skilled worker means the loss of innumerable man-hours of production experience.

If another war comes, the very life of industry at the beginning of the conflict may depend on adequate civil defense.

Charles O. Herb

EDITOR

Cold water strikes red hot metal in end-quench hardenability test—first step in Ryerson quality control.

RED HOT REASON for Buying Ryerson Alloys

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Now more than ever this Certified Plan makes Ryerson your best source for alloys. Though defense demands are taxing even our extensive facilities we can undoubtedly take care of most of your requirements. So for quick shipment of pre-tested alloy steels which you can buy and heat treat with confidence, call the nearest Ryerson plant. And remember we also carry heat treated alloys in stock for immediate shipment.

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PRODUCING GAGE-BLOCKS TO "MILLIONTHS"

By RAYMOND A. GIERLICH, Master Gage-Maker
Continental Machines, Inc.
Savage, Minn.

INCREASING demand for tight metal-to-metal seals on products such as automatic hydraulic transmissions for automobiles and tanks has multiplied industry's problem of producing extremely accurate, smooth, flat surfaces. An important source of know-how for producing such surfaces is the precision gage-block industry. Details of the techniques employed in the Savage, Minn., plant of Continental Machines, Inc., for manufacturing DoAll gage-blocks will be described in this article.

Gage-blocks have two flat, smooth, and parallel, surfaces that are spaced apart to micro-inch accuracy, and a body that is treated to minimize growth, shrinkage, and wear. They are an essential requirement in the manufacture of pre-

Fig. 1. Hot-rolled SAE 52100 steel bar stock is separated into blocks on an abrasive cut-off machine employing a 1/8-inch thick aluminum-oxide wheel.

cision interchangeable parts. Primary uses of gage-blocks are as standards for periodic calibration of other measuring instruments and machine tools; for precision measurements by light waves with optical flats; and as production gaging instruments themselves when used with functional gage pieces and holding devices.

For the direct application of gage-blocks to everyday measuring tasks, the blocks can be used individually, wrung together to form single units of the desired dimensions, or assembled with holders and attachments to form various gages or instruments. More widespread use of the latter application has been made possible by the development of the DoAll "Micro-Step" gaging system. This system is an improved method of holding gage-blocks which greatly increases their versatility. By means of extension holders (available for measurement ranges from 1 to 72 inches), complete exposure of the end measuring surfaces on the gage-blocks is permitted. Snap detent pins hold the assembled gaging instruments in rigid alignment.

Unexcelled workmanship and precise manufacturing methods are necessary to meet the stringent requirements that have been set up by the National Bureau of Standards for gage-blocks. Size—the distance between end gaging surfaces on the block—must be held within plus or minus 0.000002 inch for Grade AA blocks. Flatness and parallelism of these surfaces are maintained within plus or minus 0.000003 inch. While a surface finish of 0.9 micro-inch r.m.s. is specified, DoAll blocks are finished to 0.3 micro-inch r.m.s. Other important requirements are uniform hardness, stability (to prevent shrinkage or growth), elimination of sharp edges or burrs, ability to be wrung together, and wear and corrosion resistance.

DoAll steel gage-blocks are made from SAE 52100, a steel containing 1.45 per cent chromium, 0.35 per cent manganese, and about 1 per cent carbon. It has been found that this steel has optimum qualities for the specified requirements, and, when properly treated, remains more stable than most other steels. Tungsten carbide would be an excellent gage-block material, since it is harder and more wear-resistant, were it not for the fact that the coefficient of expansion of tungsten carbide is less than one-half that of steel. This would require accurate temperature measurements, computation of coefficient of expansion variations, and the addition or subtraction of corrections from the measurements. However, tungsten carbide is used for wear strips and this material is received from a number of sources ready for grinding and lapping.

A total of 131 sizes of gage-blocks, ranging from 0.010 to 20 inches in length, are produced. Steel blocks up to 0.150 inch long are made from bars 7/16 inch thick by 1 3/16 inches wide, and bars 7/16 inch thick by 1 7/16 inches wide are used for blocks 0.150 inch and longer. The hot-rolled bar stock is purchased in 20-foot lengths, and a 1-inch long sample is taken from each bar to check the hardenability and stability of the steel. Samples are subjected to the standard specified heat-treatment to see if the desired hardness is obtained, and, after normalizing, they are measured periodically to determine the amount of growth or shrinkage.

Blocks are separated from the bars on the abrasive cut-off machine seen in Fig. 1, employ-

ing a rubber-bonded, aluminum-oxide abrasive wheel 12 inches in diameter by 1/8 inch thick. The blocks are cut 0.040 to 0.050 inch over size in length (the length of a gage-block being in all cases the distance between its measuring faces) to allow for subsequent finishing.

All surfaces except the end gaging surfaces of the blocks are rough-ground on DoAll surface grinding machines, such as the one seen in Fig. 2. A vitrified-bond, aluminum-oxide abrasive wheel of 65 grain size is used, and about 0.010 inch of stock is left on the top, bottom, and both side surfaces for subsequent finish-grinding. The grinding machine is equipped with a "Cool Grinding" unit in which coolant is introduced into the arbor hole of the grinding wheel. The coolant is thrown outward by centrifugal force through the wheel to the point of grinding. This method keeps the work surface cooler than with conventional methods of applying coolant, minimizes cracking and warping of the work, improves the surface finish, and increases the wheel life. Even with this set-up, the shorter gage-blocks have to be turned over periodically to prevent warping.

Heat-treatment consists of bringing the blocks to a temperature of 1550 degrees F. The blocks are arranged on trays and placed in a gas-fired muffle type furnace. Time needed to bring the blocks to the required temperature varies from one-half to three hours, depending on the size of the gage-blocks. After heating, the blocks are quenched in oil maintained at a temperature of 120 degrees F. Then they are tempered to reduce brittleness and remove internal strains by immersion in an oil bath held at 220 degrees F. for one hour and cooling in still air at room temperature. One block out of each batch is tested for hardness, and a minimum hardness of 65 Rockwell C is required.

Gage-blocks are finish-ground, with the exception of the end gaging surfaces, on another DoAll surface grinding machine. Approximately 0.010 inch of stock is removed from the top, bottom, and both side surfaces, using the same type wheel as for rough-grinding. Thickness of the blocks is maintained within plus or minus 0.002 inch of the required 0.350 inch size, while width is held to the same tolerance on both the 1.125 inch width for blocks up to 0.150 inch in length and the 1.375 inch width for longer blocks. The most important requirement of this operation is maintaining squareness of the surfaces within plus or minus 0.0005 inch. This is essential since the squareness of the blocks cannot be corrected during lapping.

As previously mentioned, carbide wear blocks are received from the suppliers ready for finish-grinding. A resinoid-bonded diamond abrasive wheel of 100 grain size and 100 concentration is employed for grinding the carbide materials. Since these materials are non-magnetic, special mechanical fixtures are required to hold the parts on the table of the grinding machine.

Stabilization, to insure that the gage-block size remains constant for many years, is then accomplished by alternately cooling and heating the block a number of times. This treatment produces a more complete transformation of retained austenite to martensite. Greatly accelerated production is possible, since not more than four days is required to stabilize a batch of gage-blocks with this method. Prior to the development of this cold treatment, up to six years was required to age (stabilize) the blocks.

In this stabilizing process the gage-blocks are

Fig. 2. Surface grinding machine equipped with a "Cool Grinding" unit is used to finish-grind top, bottom, and both sides of blocks.

Fig. 3. A dry ice refrigerating unit cools the blocks to a temperature of between minus 100 to 120 degrees F. Blocks are immersed in wax lubricant.

submerged in pans containing a wax lubricant to prevent oxidation, and the pans are placed in a dry ice refrigerating unit, Fig. 3, which cools them to a temperature between minus 100 to 120 degrees F. After six to ten hours, depending on the length of the gage-blocks being treated, they are removed and allowed to reach room temperature. Since a martensitic structure occupies more space than an austenitic one, internal stresses are set up as the transformation takes place and the grain crystals grow. To relieve these stresses, the blocks are tempered by heating to a temperature of 230 degrees F. for three hours in a gas-fired furnace, Fig. 4.

This cooling-tempering cycle is repeated from eight to ten times, thus increasing the martensitic microstructure from approximately 93 per cent (after heat-treatment) to close to 100 per cent. About 10 per cent of each batch of blocks is subjected to a Bureau of Standards approved stability test, consisting of immersing the blocks for twenty-four hours in a boiling 0.5 to 1 per cent potassium dichromate aqueous solution. If, after this treatment, the dimensions of the blocks change more than 2 micro-inches per inch, the blocks are considered unstable and are rejected. If not, they are placed in a rough inventory stock.

Lots of finished gage-blocks are ordered in quantities of 16 or multiples thereof for any one size. When an order for 16, 32, 48, or 64 blocks of a size has been issued, the required number of blocks are drawn from rough inventory and their end gaging surfaces are ground to 0.0010 inch (plus 0.0003 minus 0.0000 inch) over the required size.

The finish-ground blocks are magnetically inspected to determine whether any surface checks or cracks have resulted from the heat-treating or grinding operations. This inspection is performed while the blocks are still mounted on the magnetic chuck of the surface grinding machine. Grinding coolant is blown from the surfaces of the work-pieces and chucks, and fine iron-oxide

Fig. 4. Gage-blocks are tempered by heating to 230 degrees F. for three hours in a gas-fired muffle furnace to relieve stresses.

Fig. 5. A magnetic comparator having two magnetic coils and an electrical measuring system compares hardness and soundness of block with a master.

particles suspended in kerosene are flowed onto the work. If cracks or defects exist, the iron-oxide particles will be attracted to them, and can be seen by the operator.

The General Electric magnetic comparator shown in Fig. 5 is also used at this point in the processing to detect any internal flaws in the steel, such as pipes or overlays that would not show up in the magnetic inspection, and to re-check the hardness of the blocks. With this set-up, two magnetic coils and a sensitive electrical measuring system are employed to compare the electrical resistance of each block (placed in one coil) with that of a known master (placed in the other coil). The master has been previously tested with a Rockwell hardness tester and a Magnaflux inspection unit. Any variation of the gage-block from the standard, as indicated on the meter, is reason for rejecting the blocks.

All sharp edges on the gage-blocks which might cut the operators or scratch the laps are rounded on the special corner-breaking machine shown in Fig. 6. The machine is equipped with a 600 grit, silicon-carbide abrasive wheel 4 inches in diameter and 1 1/2 inches wide, which is rotated at 17,000 R.P.M. Mounted directly above the grinding wheel is a cradle type work-holding fixture that is rocked by hand through an angle of 90 degrees. Two adjoining surfaces on the gage-blocks are manually held against locating plates that form a 90-degree opening in the rocking fixture, and a bottom opening between these two plates allows the sharp corner edge of the block to project below the fixture

Fig. 6. Special corner-breaking machine for rounding sharp edges of gage-blocks. Fixture is rocked by hand through 90 degrees.

Fig. 7. Over-all view of one air-conditioned lapping room. Operator in right foreground is shown checking flatness of lap plate with optical flat.

and contact the grinding wheel. When the fixture is swung back and forth, a radius of about 1/32 inch is generated on the gage-block corners.

After demagnetizing, the gage-blocks are ready to be lapped. Lapping, as well as corner breaking, etching, and inspection, is performed in a separate enclosure having a floor space of about 200 square feet. This area is supplied with conditioned air from a 27-ton refrigeration unit. The air temperature is maintained within plus or minus 1 degree of 68 degrees F., and the maximum humidity is held at 48 per cent. A complete air change is made every two minutes, but a high-velocity air cleaner permits the re-use of some of the conditioned air by removing abrasive particles, dust, lint, etc.

Lapping of the gage-blocks (performed only on the end gaging surfaces of sixteen blocks at a time) consists of four separate operations: rough-lapping and semi-finish-lapping, and the so-called first and second "polishing" operations. In each succeeding operation, progressively finer abrasive particles are employed. An over-all view of one of the two air-conditioned lapping rooms is seen in Fig. 7. Lapping is performed on modified Norton machines (shown in the right-hand row) and on special machines (left) built by Continental Machines.

On the Norton lapping machines, the floating upper lap plate does not rotate, but the lower plate is rotated by a variable-speed electric motor drive. Eccentric motion of the lower lap is obtained through planetary gearing which also rotates the work-holding spiders. The adjustable eccentric action is such that the spiders will not repeat the same path of motion in 220,000 revolutions of the spider. However, after 1800 revolutions of the spider, the gage-blocks return to their initial positions on the lap blocks, thus helping to maintain the flatness of the laps. The Continental lapping machines are similar except that the bottom lap is locked during lapping and only the spider and gage-blocks rotate.

Variable-speed drives are required to lap various size blocks and to perform the different operations. Faster speeds, from 60 to 90 R.P.M., are used for rough-lapping, and about 30 R.P.M. for finishing operations. Also, slower speeds are necessary when charging the laps with abrasive, especially with brittle silicon-carbide abrasive.

Lapping plates, which are made from fine-grain Meehanite cast iron, are normalized, stabilized, and kept in sets of three. The flatness of the plates is checked periodically by means of optical flats, as seen at the lower right in Fig. 7. If not flat within one-half wave length of light or a maximum error of 0.00001 inch per inch, they are run together two at a time on the machine. First, one lap of the set is run with the second, then the third with the second, the second with the first, the third with the first, the second with the third, and finally the third with the first.

The work-holding spiders are pierced steel plates having four concentric rows of sixteen rectangular openings each. A clearance of about 0.035 inch is provided on all sides between the gage-blocks and the spider openings to facilitate

Fig. 8. Abrasive is applied to the laps by wiping with a soft cloth. The abrasive — silicon carbide for rough-lapping — is suspended in lard oil and petrolatum.

loading and unloading. A set of spiders is provided for each machine so that there will be no transfer of abrasive between machines.

In rough-lapping, approximately 0.0011 inch of stock is removed from each gage-block (0.0005 to 0.0006 inch from each end gaging surface) in twelve runs, each of thirty seconds duration. This brings the gage-blocks to within 0.00019 inch of the required size, and produces a surface finish of about 2.5 micro-inches r.m.s. A silicon-carbide abrasive of 600 grain size, suspended in a carrier medium of lard oil and petrolatum is employed for rough-lapping. The abrasive is applied to the laps by wiping with a soft, lint-free cloth, as shown in Fig. 8, using rotary scrubbing motions. The laps are charged by running them together until the abrasive has been worked in. Then more abrasive is applied to the laps, the gage-blocks are placed in the spider, and the first lapping cycle is begun, Fig. 9.

After each thirty-second lapping run, the positions of the gage-blocks in the spider are changed, as seen in the heading illustration, so that uniform wear takes place on each block. The method of interchanging the blocks is extremely important, and is illustrated diagrammatically in Fig. 10. Half the blocks (in diametric rows 1-9, 3-11, 5-13, and 7-15) are moved from the outer radial row to positions in the inner radial row, at locations diametrically opposite on the spider. The remaining eight blocks (in the alternate diametric rows 2-10, 4-12, 6-14, and 8-16) are also moved to the inner radial row, but in a diametric row 45 degrees from the

Fig. 9. During lapping, the gage-blocks — retained in pierced steel spiders — are rotated between stationary upper and lower lap plates.

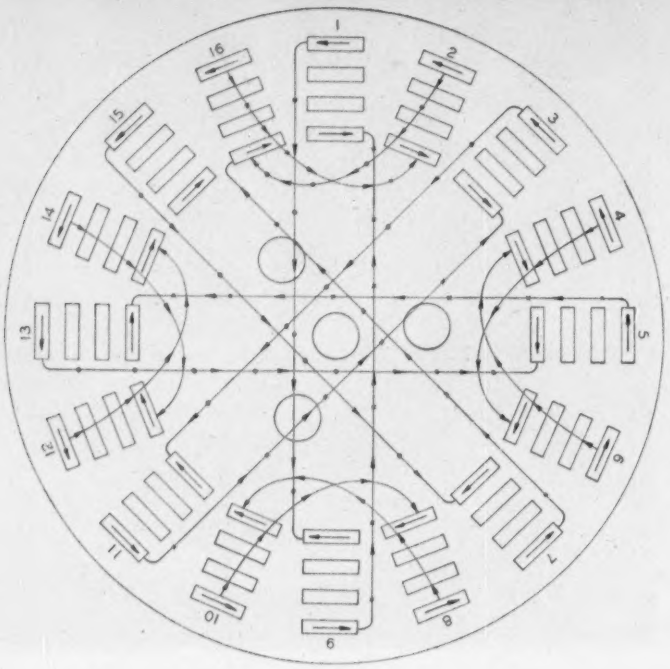


Fig. 10. Diagrammatic illustration of method of interchanging the blocks in the spider. Blocks are moved to other radial rows in subsequent changes.

ones in which they were previously lapped. Also, the blocks themselves are rotated through an angle of 180 degrees (not turned over, end to end) so that they will be rotated in the opposite direction on the lap plates.

The same system of interchange is used after each succeeding lapping run, except that on the second run blocks in the even diametric rows are switched diametrically opposite on the spider and to the next to the outer radial row, while blocks in the odd diametric rows are switched to the diametric row 45 degrees away. For the third run, the next to the inner row is filled.

After every fourth lapping run, the gage-blocks are removed from the spider and cooled to room temperature by placing them on a steel block (kept in the air-conditioned room) for about thirty minutes per inch of length. The length of the gage-blocks is then measured by means of an electric comparator with a dial having 0.00001 inch graduations. Before the gage-blocks are replaced in the spider on the machine, more abrasive is applied to the surfaces of the laps. The blocks are handled with gloves or forceps to prevent the absorption of body heat.

In semi-finish-lapping, 0.00012 inch more stock is removed from each gage-block (0.00006 inch from each gaging surface), bringing the blocks to within 0.000070 inch of the required size and producing a surface finish of approximately 1.5 micro-inches r.m.s. For this operation, consisting of about twenty-four lapping runs of ten seconds each, an aluminum-oxide abrasive equivalent to 1200 mesh screen size, and suspended in a carrier medium of lard oil and petrolatum, is employed. When the laps are run together (prior to lapping) with this fine abrasive, the abrasive is constantly wiped off until the lap surfaces become dry, shiny, and non-abrasive. Rejected gage-blocks are rubbed across the laps, prior to starting the semi-finish-lapping runs, to insure that there is no apparent abrasive action or scratching.

For semi-finishing, the lap plates are worked together to a flatness within one-quarter wave length of light or a maximum error of 0.000005 inch in 4 inches. Positions of the gage-blocks in the spider are changed, as in rough-lapping after each run. Flatness of the blocks is checked after every fourth run by means of optical flats and monochromatic light. Size is again inspected with electric comparators.

In the first "polishing" operation, the lapping plates are broken down in the same manner as for semi-finish-lapping, except that 2 micron (particle diameters between 0.01 and 0.0001 millimeter) levigated alumina abrasive, suspended in a similar carrier medium, is employed. About eight lapping runs of five seconds duration each are required to remove 0.00004 inch of stock, bringing the blocks to within 0.000030 inch of size and producing a surface finish of 1 micro-inch r.m.s. At this point in the processing, it is extremely important to check the size, flatness, and parallelism of each block carefully.

A 0.5 micron levigated alumina abrasive, also suspended in the same carrier medium, is employed for the second "polishing" operation, which removes the last 0.00003 inch of stock and brings the blocks to final size. Prior to this

final lapping, the lap plates are worked together to a flatness of 0.000002 inch in 4 inches. The rolling action of the fine abrasive (not imbedded in the lap plates) wears away the surface imperfections on the gage-blocks. As lapping continues, the abrasive particles are broken down even finer, and, since the surfaces being lapped become flatter, lower unit pressures are exerted. Consequently, rate of stock removal decreases and a near scratch-free surface is produced.

It is interesting to note that Continental buys the finest size abrasive purchasable, and then does its own levigating to obtain the fineness required for this lapping operation. Another interesting point is that the hardness of the gage-blocks after final lapping has increased to 65.5 Rockwell C.

Corner breaking and lapping of carbide wear blocks is accomplished in the same manner as with steel blocks except that the operations are performed in a separate air-conditioned room, and diamond abrasive powders of about the same grain size as used on steel are employed. Rough-lapping the carbide blocks usually requires more time than steel because parallelism cannot be held to as close a tolerance with the mechanical methods of holding used during the preceding grinding operation. Shorter lapping runs with more frequent changing of the block positions are generally necessary to insure parallelism on carbide blocks.

An attempt is made to finish the blocks within the allowable plus tolerance, rather than under size, to allow this small amount of stock for subsequent wear. National Bureau of Standards specifications permit the following plus or minus tolerances per inch of block length: 0.000002 inch for Grade AA, 0.000004 inch for Grade A, and 0.000008 inch for Grade B. Also, the same specifications allow a surface finish of 0.9 micro-inch r.m.s., but this final lapping operation produces a 0.5 micro-inch or finer (average 0.3 micro-inch) finish on the DoAll blocks.

Smoother surface finish on gage-blocks results in a lower rate of wear because pressures on the blocks are distributed evenly over a greater area. Wringability is also improved. Appearance is often a misleading standard for judging surface finish. For example, a bright, shiny surface may be caused by many scratches which reflect light in all directions. However, a scratch-free surface may appear dull unless all of the reflected light reaches the eye of the observer. On ultra-smooth surfaces, even very fine scratches may appear amplified because of the surrounding optically flat finish.

After lapping, the rounded edges previously produced in the corner-breaking operation, no longer blend smoothly with the end gaging surfaces on the blocks. Since the semi-sharp edges and burrs produced on these corners during lapping might interfere with wringing together of blocks and also diminish their wear resistance, they should be removed. This is done by means of a "Burr-Proofing" corner blending operation, which is manually accomplished on a hard felt wheel impregnated with a 1200 mesh, silicon-carbide abrasive paste.

The size, name, and serial number are engraved on each block by means of the Gorton pantograph engraving machine seen in Fig. 11. The blocks are first masked with a heated benzol solution of asphaltum, beeswax, and dragon's blood (a drying agent) applied by painting with a camel's-hair brush. The required numbers and letters are then cut in the wax (down to the surface of the gage-block) by means of a 0.006-inch diameter needle mounted in the spindle of the engraving machine. Downward pressure of the needle must be carefully controlled to prevent distorting the blocks. A 5 per cent etching solution of nitric acid in water is then applied to the engraved characters with a fine-tipped dropper, and is drawn off after one and one-half minutes with a similar dropper. The etching fluid is neutralized by submerging the blocks in a solution of sodium bicarbonate.

Carbide blocks are engraved on a special machine with an electrolytic method of reverse plating. The same type of wax masking is employed, but a stronger etching fluid (25 per cent solution

Fig. 11. Size, name, and serial number are cut in the wax coating on the gage-blocks by means of the pantograph engraving machine here illustrated.

of nitric acid) is needed to attack the carbide. As with steel blocks, the application of individual serial numbers permits a case history to be kept of each block. The wax mask is removed, prior to final inspection, by cleaning the blocks with carbon tetrachloride and naphtha solvents.

Size, flatness, and parallelism inspection is accomplished by comparison with sets of gage-blocks called "working masters." These working masters are recalibrated weekly by comparing with master blocks, which, in turn, are recalibrated monthly by comparing with grand masters. Six sets of grand masters are maintained, and one set is calibrated by the National Bureau of Standards every three months. Working masters are graduated into rough, semi-finish, and finish sizes for use in the lapping rooms, and are also used for final inspection of size, flatness, and parallelism of the blocks.

Final size inspection of the gage-blocks is accomplished on DoAll electric comparators, such as the one shown in Fig. 12, which are calibrated at periodic intervals with the working masters. The lower gaging surface of the block rests on a three-point ball-support anvil, permitting more accurate contact of the gage spindle on the upper surface of the block. Benches on which the measuring instruments are mounted are isolated from vibration by providing thin rubber strips between the bench legs and the floor.

Since variations between the comparator readings of several inspectors is possible, two independent size checks are made on each block. If the two readings vary 0.000002 inch, a third inspector rechecks the block sizes.

Flatness and parallelism of the gage-blocks are also checked twice, by two different inspectors. Flatness is inspected by resting the block on an optical flat, and placing another flat on top of the block. When viewed under monochromatic light, each dark interference band represents a height change of 0.0000116 inch above the line of contact between flat and block.

The inspector must note the straightness and parallelism of the interference bands, the relative distance between the bands, and the direction of band curvative, if any. If the bands are straight, parallel, and the same distance apart, the surface of the block is exceptionally flat. However, if the bands curve toward the line of contact between flat and block, the surface is convex—and if they curve away, the surface is concave. When the relative distance between the bands varies, the surface is higher where the bands are farthest apart.

Parallelism between the end gaging surfaces of each gage-block is also determined by optical flats under monochromatic light. For this test, however, a working master of known parallelism and the block being inspected are both wrung to an optical flat base and another optical flat is placed on top of the blocks. Any variation in the direction of the interference bands indicates the amount that the surfaces are out of parallel on the block being tested.

Final grading of all gage-blocks is made by a chief inspector. Each block is classified in the lowest grade indicated by any of the several different inspections for size, flatness, parallelism, surface finish, hardness, and stability. Prior to shipment, the gage-blocks are given a corrosion-preventive treatment involving immersion in two solutions of Tectyl. The gage-block sets are packed in plastic boxes and placed in an air-tight container which includes a bag of silica gel to remove any entrapped moisture.

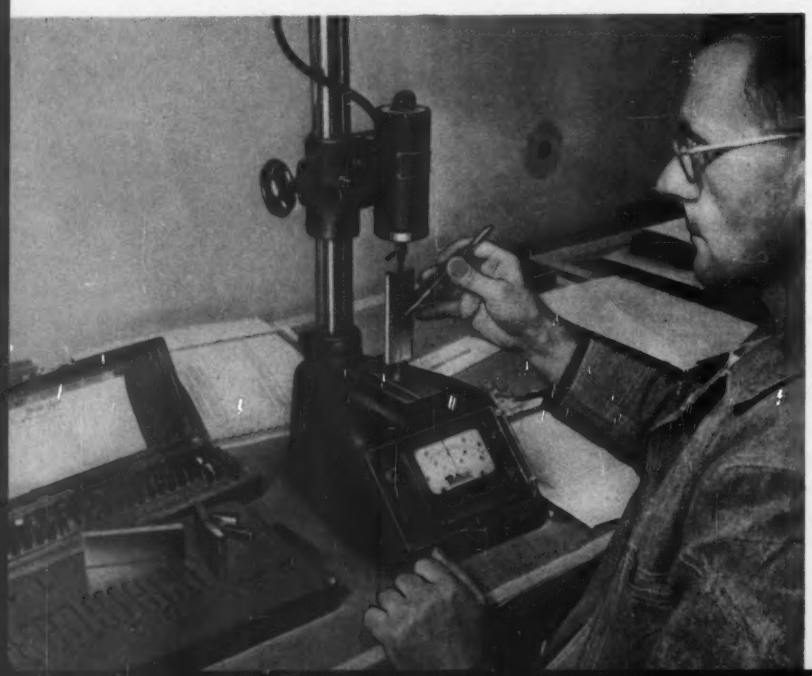


Fig. 12. An electric comparator, calibrated with working masters, is employed to check the final size of completed gage-blocks.

How One New Machine Doubled a Small Company's Output

The Nature of the Product Also was Changed Because of the Capabilities of the New Equipment. The Business was Expanded without Any Increase in Production Area

By CHARLES O. HERB

LARGE manufacturing companies are generally quick to appreciate the economic advantages that will accrue to a concern by the replacement of obsolete equipment with machines of the latest design. All too frequently, however, the smaller metal-working shops feel that they cannot avail themselves of such opportunities because of the initial monetary investment that would be involved.

The fallacy of such a belief has been proved by the experience of the Penn Electrical Co., Irwin, Pa., which in two years was developed from a $700,000 concern to one doing an annual business of $2,000,000. This remarkable business expansion was made possible by the installation of a machine which resulted in a 100 per cent increase in production with the same number of employes (approximately sixty). In addition, the versatility of the new equipment resulted in a radical change in products.

From 1898, the time the company was founded, until 1950, the products consisted largely of simple panel boards and switchboards such as seen in Fig. 1. The holes in these boards had to be laid out and then drilled or punched one at a time with conventional equipment.

Now the company specializes in elaborate switch-gear and panel cabinets such as seen in Fig. 2 and 3, and in other electrical equipment of comparable quality including unit substations,

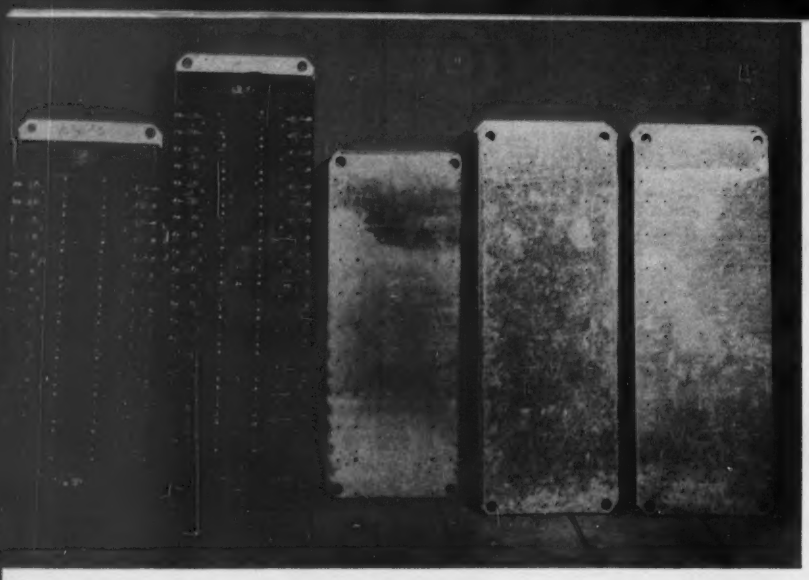


Fig. 1. Some simple types of panel boards and switchboards which were the regular products of Penn Electrical Co. before installation of a turret type punching machine.

bus-bar ducts, control panels, and steel cubicles. Most of this equipment is built to meet individual installation requirements, it being sheer coincidence if two identical units are going through the shop at the same time.

The change in products and in the amount of business resulted primarily from the installation of the Wiedemann turret type punching machine shown in the heading illustration. This machine enabled the development of simplified manufacturing methods all the way from product design through the different phases of fabrication. If holes and openings in panels were being produced by the former conventional methods, a physical lay-out of each panel would be required, as well as various drilling, punching, nibbling, fly-cutting, and oxy-acetylene burning operations. There would be from twelve to twenty handlings of each panel from the beginning to the end of the operations. With the Wiedemann machine, all of these steps are combined in one punching operation and about 300 holes can be produced per hour without any manual handling of panels between the successive punching steps. All lay-out of work has been eliminated.

Another advantage derived from the use of the turret type punching machine is the convenience of producing structural members from flat strips of steel. There is no longer the need to employ angle-irons, channel-irons, or other rolled shapes as structural members, which generally can be drilled and slotted only at a comparatively high cost. Now flat plates can be punched or notched and then formed into angle or channel shapes on a press brake.

Large panels which would take twelve hours to produce by methods formerly used can be completed in twenty minutes. One of the features of the machine is the direct measuring-spacing table with its operator's platform suspended from a longitudinal beam in such a manner that the operator moves in and out with similar movements of the work. All controls adjacent to the operator's platform move likewise with the longitudinal beam, the latter being a member of the in-and-out cross-slide.

The operator controls all steps of the operation from the one position—which includes indexing the turret to bring the desired punch and die into the working position, locating the work properly under that punch, clamping the table against movement, and tripping the press. Work up to 33 by 100 inches can be completely pierced with one handling, or up to 60 by 100 inches in two handlings. The gaging arrangement per-

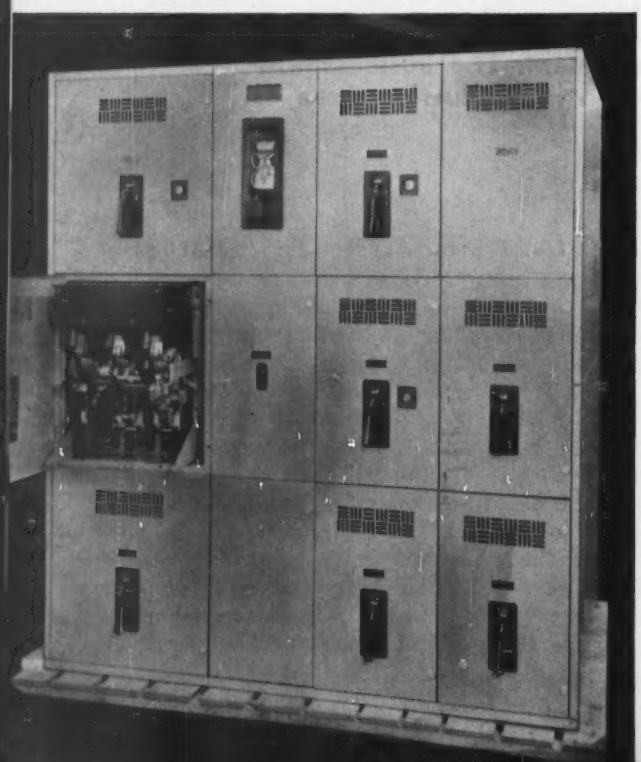


Fig. 2. Switch-gear cabinet of modern design which is now a typical product of the company.

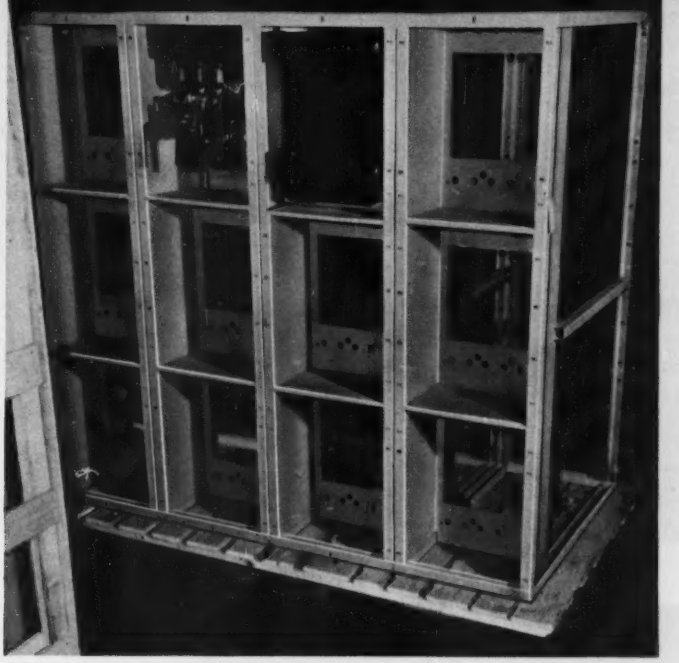
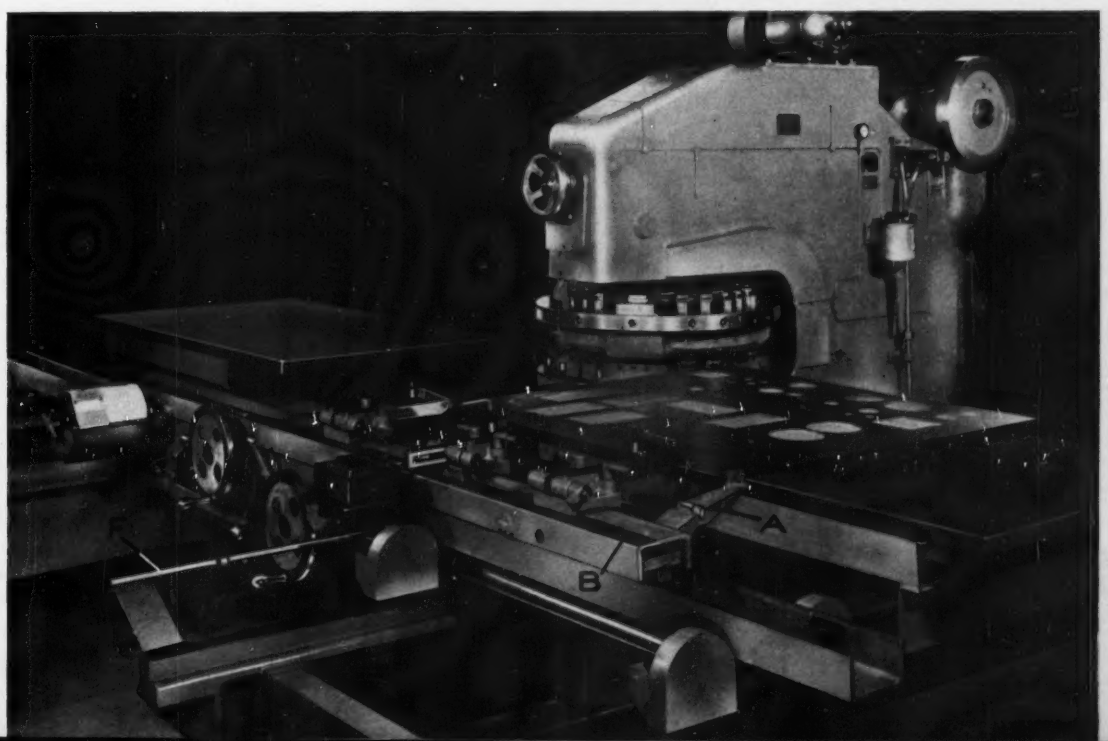


Fig. 3. A partially assembled switchgear cabinet, constructed of parts pierced on the turret type punching machine and then used flat or after forming on a press brake.

mits the locating and punching of a hole in from four to ten seconds.

After placing a steel sheet on the spacing table, the operator swings forward a stop at the right-hand end of the moving longitudinal table slide, as seen at *A*, Fig. 4. The transverse edge of the sheet is then lined up with the gaging surface on the stop so that this edge of the sheet is accurately in line with the zero graduation of a scale *B* mounted on the longitudinal table slide beam as seen in Figs. 4 and 5. Subsequently all location of holes or notches in the longitudinal direction is determined by referring the graduations on scale *B* to a zero line on block *C*, Fig. 5, mounted on the longitudinal beam which is stationary so far as lengthwise movements are concerned but, of course, moves in and out with table adjustments.

Fig. 4. Close-up view of the combined direct measuring table and gage which facilitates the accurate piercing of holes in metal sheets by means of the turret type punching press.



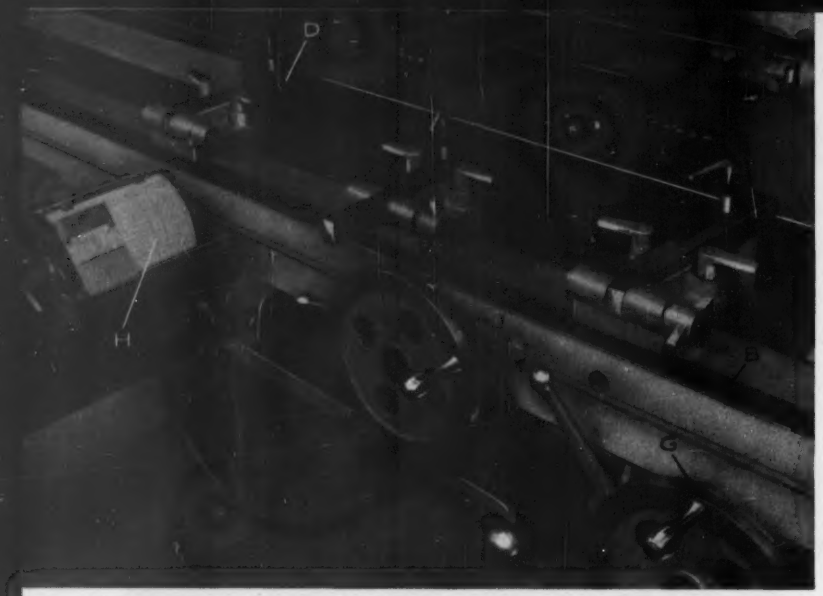


Fig. 5. View showing the controls for the direct measuring table and gage provided on the turret type punching press. Verniers facilitate accurate work settings.

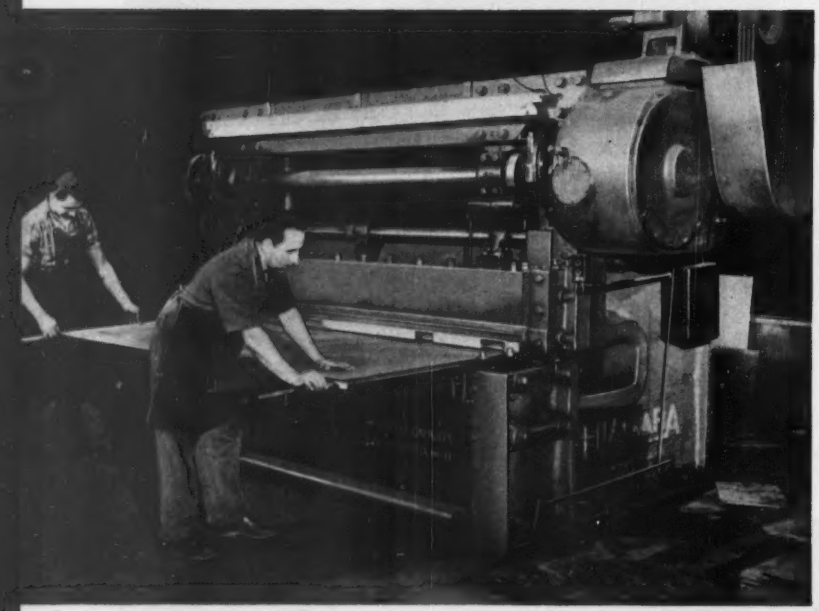


Fig. 6. Shear employed in cutting sheets to the final outside dimensions before performance of the piercing operation.

Fig. 7. Press brake which is used to bend pierced sheets of strip material into structural members or other bent shapes

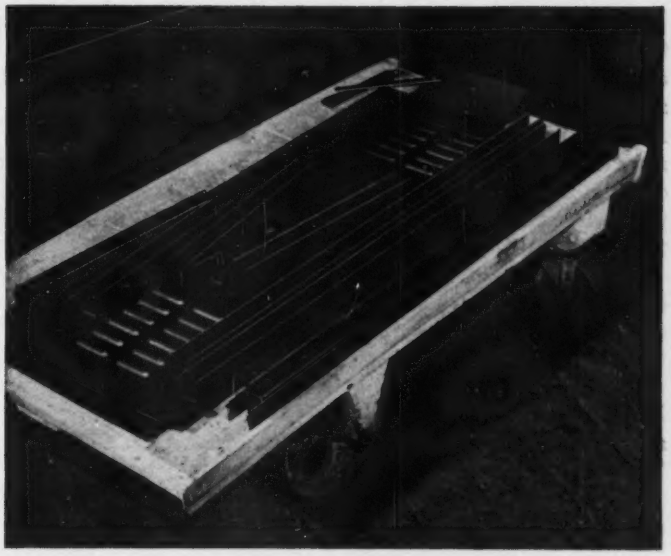


Fig. 8. Truck load of typical panel members that were pierced on the turret type punching machine and then formed into structrual shapes on the press brake

After the work sheet has been positioned against the swinging stop, several work-holders which may be adjusted along the longitudinal cross-slide are positioned against the front edge of the work, as seen at *D* and *E*, to hold the sheet squarely on the table and to properly locate the sheet with respect to a scale mounted in a stationary position on the machine bed, as seen at *F*, Fig. 4. Another zero line on a block attached to the in-and-out cross-slide moves along this stationary scale to facilitate in-and-out settings of the spacing table and work. Final settings are conveniently made from graduations on handwheel *G*, Fig. 5, which is revolved to effect the in-and-out table movements, and from the graduations on handwheel *J*, which is revolved to obtain longitudinal movements. The table slides move on rollers, locking levers holding them firmly in predetermined positions during each punching operation.

The punching of large sheets with a considerable number of holes or notches is facilitated by mounting a chart on the cylinder at the left of the operator's station as seen at *H*. Three columns of figures are provided on the chart for each job. The first column of figures identifies the particular punch and die to be used for each step of the operation. This column gives the station numbers of the individual punches. The second column gives the in-and-out dimension from the front edge of the sheet to the center of each hole, while the third column gives the lengthwise dimension from the right-hand edge of the sheet to each hole.

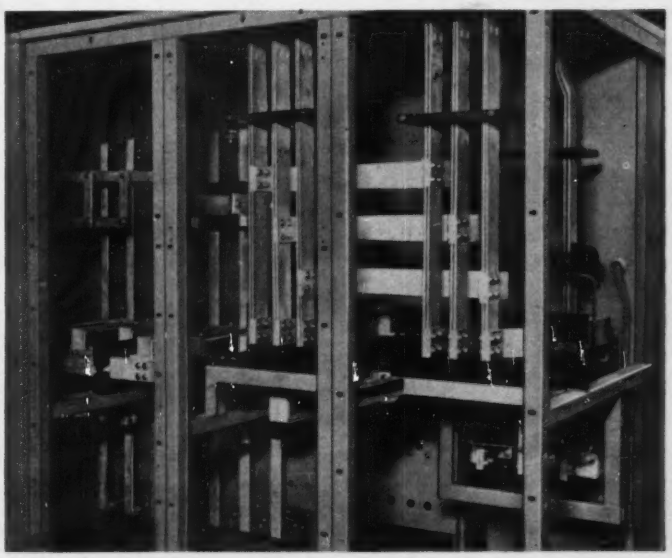


Fig. 9. Bus-bars are assembled in various arrangements in the switchgear cabinets, all of the bus-bars now being pierced rather than drilled.

Both dimensions for each hole are read through a small window in a bracket positioned on the front side of the chart. The chart indexes automatically with each tripping of the press. All dimensions are given in decimals, this being a factor that greatly facilitates the preparation of the charts. Computations are made and printed on the charts through the use of a modified adding machine.

The piercing of large panels is accomplished expeditiously by an operator who makes successive settings of the work-table after referring to the chart cylinder, indexing the turret to line up the proper punch and die, and then depressing a button to trip the machine. Work settings are ordinarily made in ten seconds or less. Hole locations can be readily held to specific dimensions within 0.002 inch. As a result of this accuracy, assembly time on housings and cabinets has been reduced materially. All products are made to NEMA specifications.

One of the safety features of the machine is that the ram cannot be operated unless the particular punch to be used is correctly aligned with its respective die. The various punches and dies are successively brought into position by indexing the turret the required amounts. Turret indexing is simply accomplished by turning a knob on an electrical control panel.

Punches and dies can be changed ordinarily within two o rthree minutes. Holes as small as one-half the thickness of the material can be punched, holes only 0.089 inch in diameter being common. Holes as large as 6 inches in diameter can be punched through 1/8-inch steel on this machine, or as large ar 3 inches in diameter through 1/4-inch sheets. Square or rectangular holes of any dimension can be produced by punching one corner of the hole and progressively punching around the sheet until the desired opening has been cut.

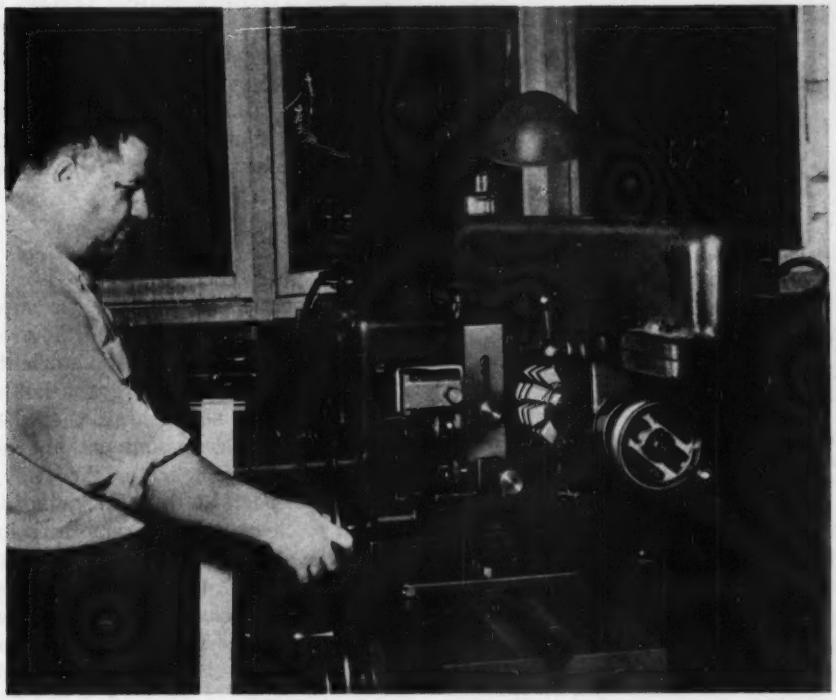
In addition to the advantages already mentioned, this turret type punching machine has eliminated fourteen other machines, and has provided 15 per cent greater floor space for assembling operations and work storage. Also, materials-handling has been reduced 75 per cent.

The sheets of steel to be punched are generally cut to required outside dimensions by the Niagara shear illustrated in Fig. 6, while Fig. 7 shows the Dreis & Krump brake employed for forming structural members or formed panel parts. On the truck in Fig. 8 are typical pieces formed on the press brake.

The Penn Electrical Co. fabricates a variety of units which employ bus-bar arrangements, a typical unit being illustrated in Fig. 9. Any number of holes from two to six must be pierced through the ends of all bus-bars, and in some instances additional sets of holes are pierced along the bars. In former years, six men were required solely for drilling bus-bar holes one at a time. Today, the holes are punched on the Wiedemann turret type machine illustrated in Fig. 10, the illustration showing the machine set up for piercing four holes at a time. Only two men are now required for laying out and punching the holes, and assembling the bus-bars.

Fig. 10. Turret type punching press which is employed in piercing from one to six holes simultaneously through the copper bus-bars

Be Kind to Your Hobs



A Few Pointers on Gear Hob Use and Maintenance that will Increase Gear Accuracy and Lower Unit Costs

By CHARLES R. STAUB, Chief Engineer
Michigan Tool Co., Detroit, Mich.

IN their current state of development, gear hobs are among the most precise production tools made today. They are carefully designed to produce specified profiles, manufactured on special machines, heat-treated by controlled processes, and individually inspected to meet rigid standards. Both the total life of a hob and the accuracy with which it maintains the profile it is designed to generate are directly affected by sharpening as well as by the procedure that is followed in setting up and operating the hobbing machine.

Frequent Hob Sharpening is a "Must"

An important contributory factor to total hob life is frequent sharpening. A sharp hob will cut faster, use less power, and wear longer than one that is permitted to dull excessively. In addition, a sharp hob will produce work having a higher degree of accuracy and a better finish than one not maintained in first-class condition. Sharpening at frequent intervals requires removal of only a small amount of stock from the tooth faces. When sharpening is delayed until the cutting edges become blunt, rapid wear produces deep pitted portions in the flanks of the teeth; and whatever time is gained by operating the hob longer is cancelled by the additional sharpening time required to restore the hob to its original condition. Furthermore, where much metal has to be removed by the grinding wheel, there is always the risk that resultant heat will cause checks to develop in the hob, as in Fig. 1, permanently ruining it.

Most hobs have radial cutting faces on the teeth; others have hook, or positive, rake. The gashes creating the flutes and tooth rows of the hob are either straight or helical. In straight-gashed hobs, the tooth face is parallel to the hob

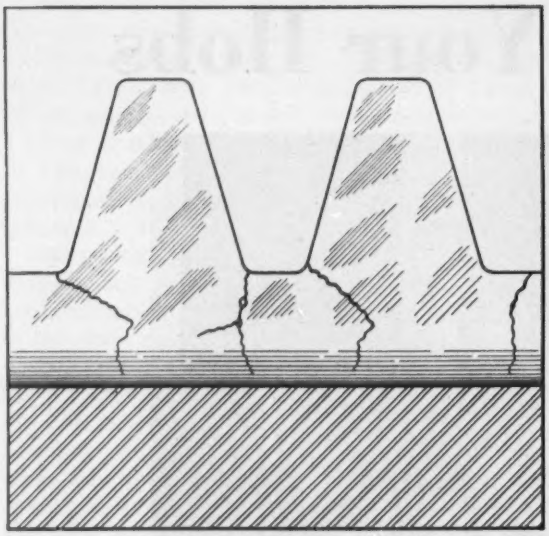


Fig. 1. Checks from excessive heat developed in sharpening are visible in this hob tooth section.

axis, whereas in helical-gashed hobs, the tooth face is normal to the hob "thread." In his decision as to what characteristics to impart to a particular hob, the hob designer takes into account the type of material being cut, the method of processing the part, and the specifications of the required gear-tooth profile. But if sharpening fails to preserve the original characteristics of the hob, the desired profile cannot, of course, be generated in the work.

Specifications for the hob will usually be found etched on one end, and should always be adhered to when sharpening. One way to insure that hobs are correctly sharpened is to check their accuracy on suitable equipment. The motor-driven device in the heading illustration checks the lead of the hob. A recorder visible on the inspector's left keeps a permanent record of the lead. Fig. 2 shows a contour checker in use. This bench model machine checks pressure angle, modification, and protuberance of hobs up to 6 inches in diameter. In Fig. 3 is shown the operation of examining the flute spacing of a hob. The universal machine illustrated can also be used to inspect pressure angle, tooth-depth, flute parallelism, and run-out.

Sharpening Practice

When sharpening a hob, a medium-grade grinding wheel should be used. The wheel should be comparatively soft, yet sufficiently hard to avoid flying grit. To prevent hob teeth from cracking during sharpening, the wheel surfaces should be kept clean and not allowed to glaze. When used on a helical-gashed hob, it is particularly important that the grinding wheel be shaped to clear surfaces remote from the center point. The two grinding wheel shapes shown at *A* and *B* in Fig. 4 have, respectively, sufficient and insufficient clearance for their applications. Furthermore, the larger the helical angle of the cutting face, the steeper must be the bevel of the grinding wheel to provide sufficient clearance.

The first consideration in sharpening a hob is concentricity. Run-out in hobs not only unbalances the cutting action, but also affects the shape and finish of the gear-tooth profile generated. Hobs should fit the grinding arbor of the sharpening machine without play. It is also imperative that the spindle bearings of the sharpening machine be properly maintained.

The second consideration in hob sharpening is the spacing of the flutes. Accurate flute spacing is controlled primarily by the accuracy of the index-plate of the sharpening machine. Evidence of incorrect flute spacing can be seen in Fig. 5, where there is an obvious discrepancy in the relationship to the vertical center line between uppermost tooth face *A* and lowermost tooth face *B*. This reduces the tooth height of the latter by the amount shown at *C*, transferring the cutting load from

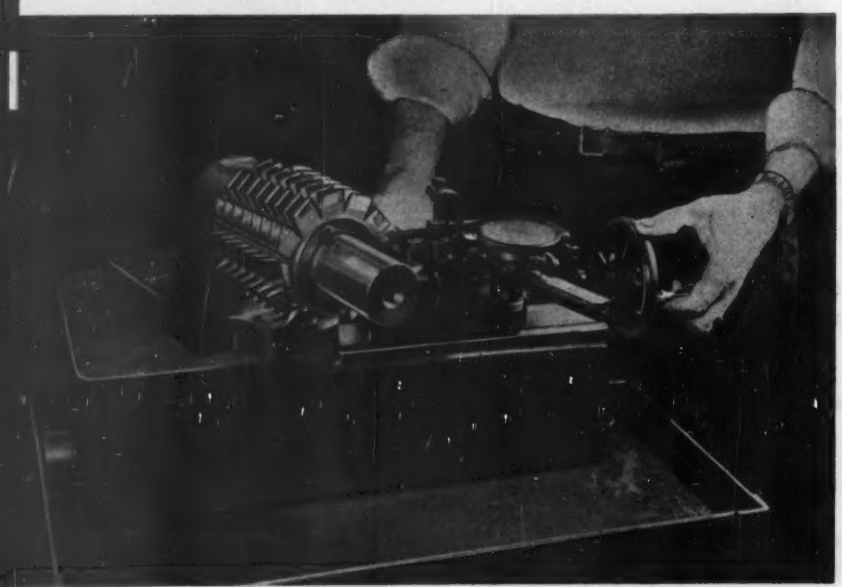


Fig. 2. The contour of a hob is being inspected on the bench model contour-checking machine seen in the illustration.

Fig. 3. View showing examination of flute spacing on a universal hob-checking machine.

the entire lowermost row of teeth to the following row. Resultant excessive hob wear, irregular cutting action, and error in the generated profile are then unavoidable.

Hob teeth with radial cutting faces should be sharpened with the grinding wheel operating in a plane that intersects the hob axis; if this style hob is ground with the wheel operating either behind or ahead of the axis, the cutting face will appear as in the upper views, Fig. 6. The generated profile will be in error, as shown in the lower views. Hobs designed with positive-rake cutting faces can be satisfactorily sharpened if the amount of hook (etched on the end of the hob) is carefully maintained.

Straight-gashed hobs must be set up for grinding so that the tooth faces are parallel to the hob axis as the hob passes under the grinding wheel. Helical-gashed hobs must rotate while passing beneath the wheel to produce the specified lead. If gash specifications on the hob are not followed in the sharpening operation, profile errors will result, the profile error varying in opposite directions from one side of a tooth to the other.

As is also axiomatic in sharpening a hob, the first consideration in setting up a hob on a hobbing machine is its concentricity with the arbor. A few wide spacing collars arranged with the hob are preferred to many narrow collars. The arbor outer bearing should be in position before tightening the end nut, or the arbor may be permanently sprung. As a next consideration, the hub (or proof) diameter of the hob should be indicated. An indicator calibrated in 0.0001 inch should be used.

Hub run-out within 0.0004 inch is permissible, assuming the high point of the run-out is unchanged from one end of the hob to the other, and not complicated by wobble, which would produce a "drunken" lead in the hob and result in tooth-form errors. If the run-out of the hub exceeds the 0.0004-inch limit, the condition

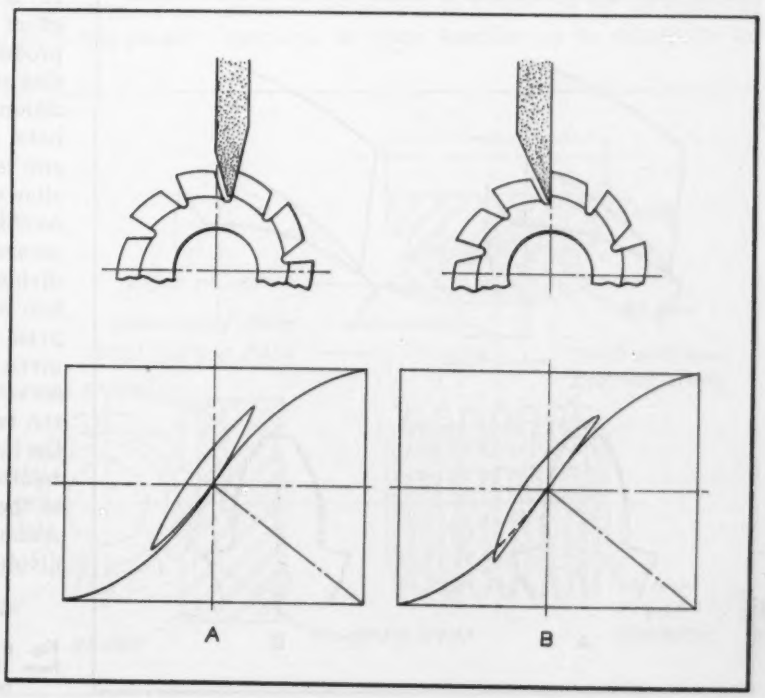


Fig. 4. Diagrams of correct wheel shape (A) and incorrect wheel shape (B) for sharpening a helical-gashed hob. The shape of the wheel must afford proper clearance at the mid-point of the flute.

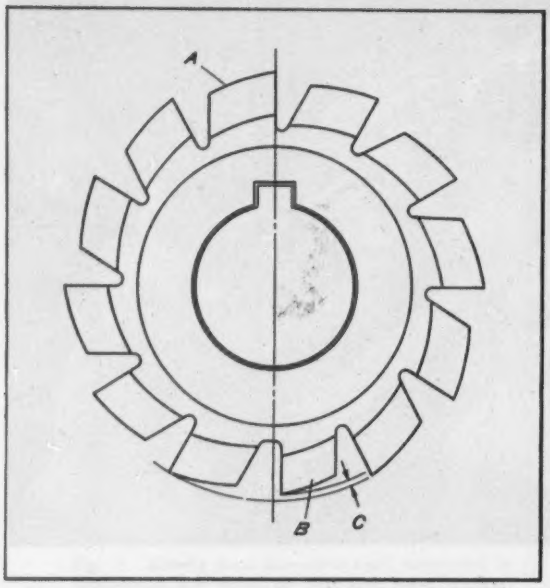


Fig. 5. The discrepancy in the relationship of teeth (A) and B) to the vertical center line is the result of incorrect flute spacing.

is quite often readily corrected by loosening the arbor end nut, rotating the spacing collars, and again tightening the nut. Possible slight errors in the parallelism of the collar faces may have caused excessive eccentricity of the hob.

After the hob has been trued on the arbor, it is then adjusted to the correct thread angle, which is etched on one end of the hob. For spur gears, the hob is set to the etched thread angle. If helical gears are being cut, the thread angle of the hob is either subtracted from, or added to, (depending on the relationship of the hand of the helices of the hob and the gear) the helix angle of the gear. It is good practice to use a hob having the same hand of helix as the gear being cut, to obtain work of maximum quality. Although it is possible to cut a helical gear with a hob of opposite hand, both the hob and gear must have the same normal pitch and pressure angle.

On all hobbing machines, the thread angle for the hob is set by referring to a scale graduated in degrees and minutes. Since the setting has no effect on the lead of a gear—that factor being controlled by gearing or cams in the hobbing machine—this method is sufficiently accurate.

Axial position of the hob on its arbor in relation to the work center line should be given attention in the set-up. If the center line is too near the end of the hob, full generating action of the hob can be lost and incorrect tooth profiles result. In Fig. 7 a formula is given for determining the distance D from the center line to the final cutting tooth. The distance F, from the center line to the hob end, must be substantially greater than D.

The greatest possible accuracy, however, is obtained by having the ideal cutting zone in the individual hob assume the cutting burden. Generally, the combined effect of tiny errors in the hob as produced will leave a particular cutting zone in somewhat superior condition. Even in the most accurate hobs, errors of tooth form, spacing, and lead—although well within the allowable 0.0004-inch limit — can combine to affect the tooth form several times the extent of any individual error. For example, in a hob having 60 teeth, 25 may comprise the total cutting zone for a given gear. Of the 25, perhaps 10 serve as roughing teeth only, and the remaining 15 actually generate the involute curve. (Fig. 8 shows the relationship of the generating zone to the total cutting zone in a hob.) Although each hob tooth may be individually accurate, errors in spa-

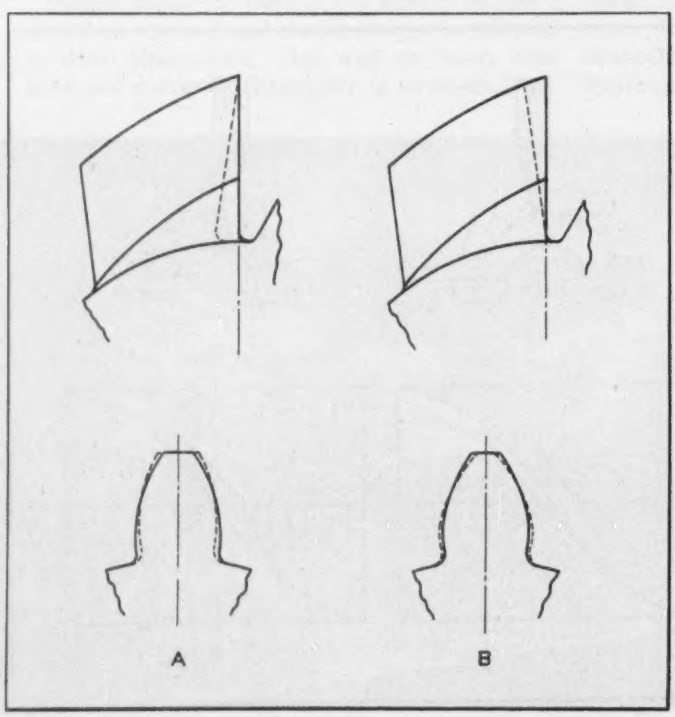
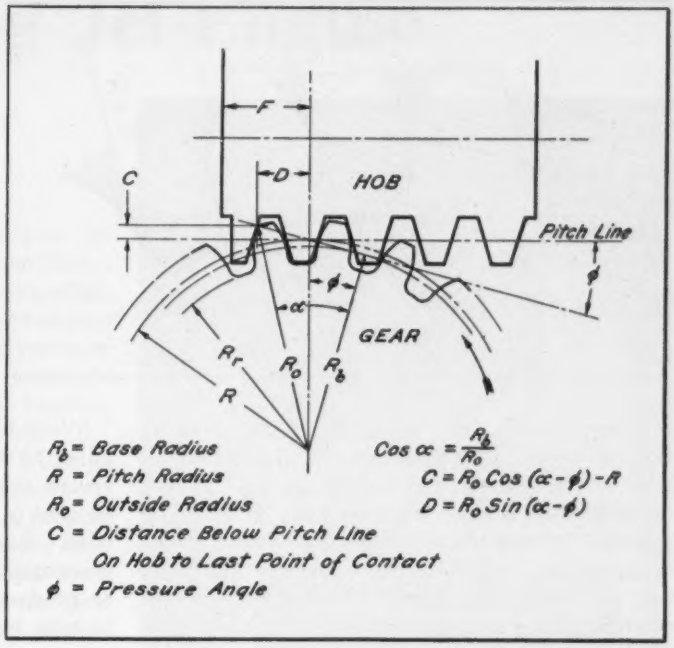


Fig. 6. Errors in tooth profiles that result from sharpening radial cutting faces behind center (A) and ahead of center (B).

Fig. 7. This diagram and equation are helpful in determining the extreme effective end position of a hob when cutting a spur gear.



cing will cause certain teeth to cut too much on one side and not enough on the other, causing the involute curve to be modified considerably. Although it may appear that with 15 teeth in the generating zone a wide departure from a true involute curve is possible, the errors actually cancel each other in practice.

By shifting the hob axially on its arbor, different composite sets of teeth of the hob can be made to do the actual generating. Thus, it is usually possible to select one or more ideal cutting zones in a hob for a gear with a given number of teeth.

All of the requirements of hob setting for maximum precision do not need to be rigidly followed in small-run set-ups for gears requiring ordinary commercial tolerances since the added time involved is hardly justified. For gears requiring the utmost in quiet and smooth performance, however, such as turbine reduction-gear sets, automotive transmission gears, timing gears, and printing press gears, extremely accurate hob setting often spells the difference between acceptable gears and gears that have to be rejected.

A hobbing machine in good condition is as vital to successful gear cutting as is the proper hob design, sharpening, and set-up procedure. Good ways and bearings are important, as well as accurate index and feed gearing or cams. Accumulated errors in index gears and feed gears and in the lead-screw impair the accuracy of the gear being cut. Often an instrument check on the angular velocity of a gear hobber is an excellent way to analyze the condition of the machine.

It is also important to operate the hobbing machine at the proper feed and speed for highest cutting efficiency. To a very large extent, the hardness and physical properties of the material being cut will influence feed and speed selection. In the accompanying table are listed approximate feeds and speeds for hobbing gears made of various materials.

The cutting action of successive hob teeth produces a series of flats which are for all practical purposes so close together as to constitute an

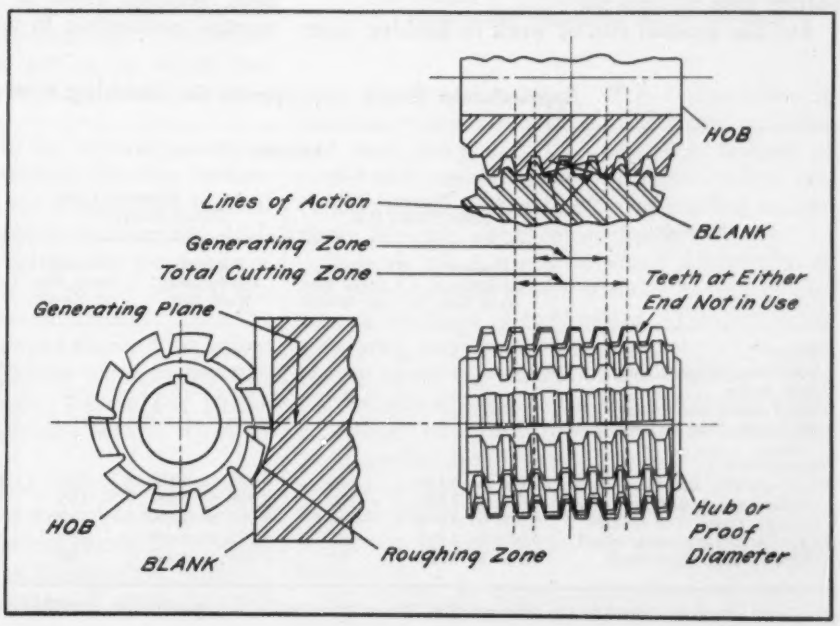


Fig. 8. Total cutting zone consists of a roughing zone and a generating zone.

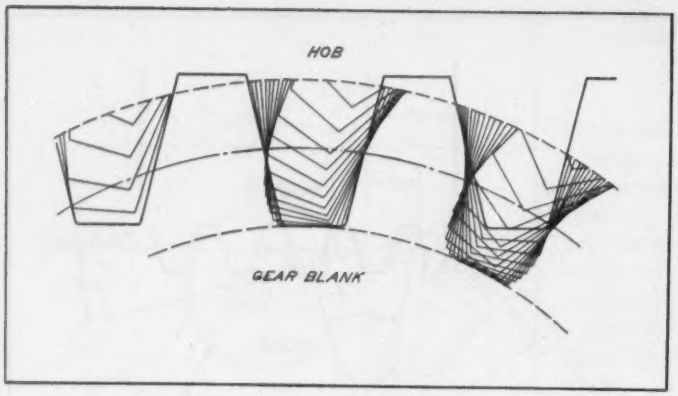


Fig. 9. Theoretically, the involute curve is a composite of a series of closely spaced flats produced by the cutting action of successive hob teeth.

involute curve. The generation of the curve by the composite of these flats is illustrated in Fig. 9. Ordinarily, the individual flats cannot be seen when a gear is rolled with its mate, or detected by even the most sensitive profile measuring device. When flats do appear in the work, they are commonly found where a hob having relatively few gashes is used to generate a coarse-pitch gear. Here, the obvious remedy is to increase the number of gashes in the hob. Merely attempting to centralize the hob teeth or spaces over the gear blank will give symmetry to the flats on both sides of the profile, but will not eliminate them.

When using in-feed on a hobbing machine to produce a worm-gear with a small number of teeth that mates with a small diameter worm, limitations are imposed on the number of gashes that can be provided in the hob, and flats will appear in the work. In some cases, the flats can be eliminated by tangentially feeding the hob rather than in-feeding.

For the general run of work in hobbing spur or helical gears, a hob centering gage is not necessary. Experience has shown that it is much more important to have the hob running true than to centralize on any particular tooth or space. For precise work, selection of the most accurate zone by axially shifting the hob to various positions can be a most important factor.

Tooth-form errors produced by eccentrically mounted hobs or from lead, spacing, and form errors inherent in the most accurate hobs can amount to many times the error from generating flats. Even if a hob is set central, it does not necessarily follow that accurate tooth forms will be produced. The combined effect of the errors in hobs must still be considered.

* * *

Defense Mobilization Report

According to the Eighth Quarterly Report to the President by the Director of Defense Mobilization, our Armed Forces have been more than doubled since the middle of 1950.

In the same period, the rate of production of military "hard goods"—including many new and complex weapons of greatly improved performance—has been multiplied almost seven times. The backlog of machine tool orders has been reduced from a peak of twenty-three months' production to ten months.

Approximate Feeds and Speeds for Hobbing Gears

Material	Roughing				Finishing	
	6 to 16 Diametral Pitch, Single-Thread Hob		6 to 16 Diametral Pitch, Double-Thread Hob		6 to 16 Diametral Pitch, Single-Thread Hob	
	Feed per Revolution of Work, Inch	Cutting Speed, Feet per Minute	Feed per Revolution of Work, Inch	Cutting Speed, Feet per Minute	Feed per Revolution of Work, Inch	Cutting Speed, Feet per Minute
Fiber	.....	...	.....	...	0.060 to 0.120	130
Rawhide, Micarta, etc.	.....	...	.....	...	0.060 to 0.120	120
Soft brass	.....	...	.....	...	0.060 to 0.120	180
Hard brass and bronze	.....	...	.....	...	0.050 to 0.090	100
Malleable iron and soft cast iron	.....	...	.....	...	0.060 to 0.100	110
Semi-steel	.....	...	.....	...	0.050 to 0.090	90
Low-carbon machine steel	0.090 to 0.120	120	0.075 to 0.100	120	0.045 to 0.075	120
Carbon steel, 0.35 to 0.45	0.075 to 0.090	100	0.070 to 0.080	100	0.040 to 0.060	100
Carbon steel, 0.45 to 0.60	0.065 to 0.075	90	0.060 to 0.070	90	0.040 to 0.050	90
Casehardening alloy steel	0.075 to 0.090	100	0.070 to 0.080	100	0.040 to 0.060	100
High-carbon alloy steel	0.045 to 0.060	60	0.040 to 0.055	60	0.030 to 0.045	60

Note: Feeds and speeds in this table are often considerably exceeded in high-production operations on newer hobbing equipment.

Heat-Treating Jet-Engine Components

LARGE furnaces of unusual design have recently been installed at the San Diego, Calif., plant of the Ryan Aeronautical Co. for the heat-treatment of aircraft jet-engine components and rocket motors. These furnaces are employed almost exclusively for relieving residual stresses caused by welding and forming processes.

Largest of the new furnaces installed at Ryan is the General Electric-built model shown in Fig. 1, which is used to stress-relieve aft-frame sections for G-E jet engines. This towering two-story furnace contains a huge brick-lined heating compartment which is supported on steel columns 9 feet above the factory floor. An ingenious loading car, containing ten of the frames to be heat-treated, rolls under the furnace and is hoisted by electric motors to form the bottom of the furnace. By loading vertically through the bottom of the furnace, heat losses are reduced to a minimum.

Heating is produced electrically by a continuous conductor which is coiled in the firebrick interior of the furnace. Sealing of the furnace bottom is effected by means of a knife-edge metal strip which runs along the bottom of the furnace—the strip descending into a sand trough located along the periphery of the loading car. The sand seal is designed to be air-tight for the normally encountered pressures of 1 1/2 inches of water, but will blow out in the event that excessive pressures accumulate in the interior of the furnace.

To prevent oxidation of the aft-frame sections while they are hot, the General Electric furnace is purged of all oxygen and filled with a neutral atmosphere during the entire heating and cooling cycles. This is accomplished by a special gas generator which partially burns city natural gas until its oxidizing agents are removed. Then the neutral atmosphere is pumped through the sealed furnace for forty-five minutes prior to heating, thus removing all the air. Excess gas passes through a vent in the furnace bottom which is closed after purging.

With purging completed, the automatic electronic controls are set and the entire heating and cooling cycles are accurately regulated without supervision. Usually, the temperature is raised at a steady rate of 200 degrees F. per hour until 1650 degrees is reached. This temperature is held for a prescribed time until stress-relieving has been completed, and then the furnace is cooled at a regulated rate. Normal cooling can be augmented by passing the circulating atmosphere through water-cooled tubes.

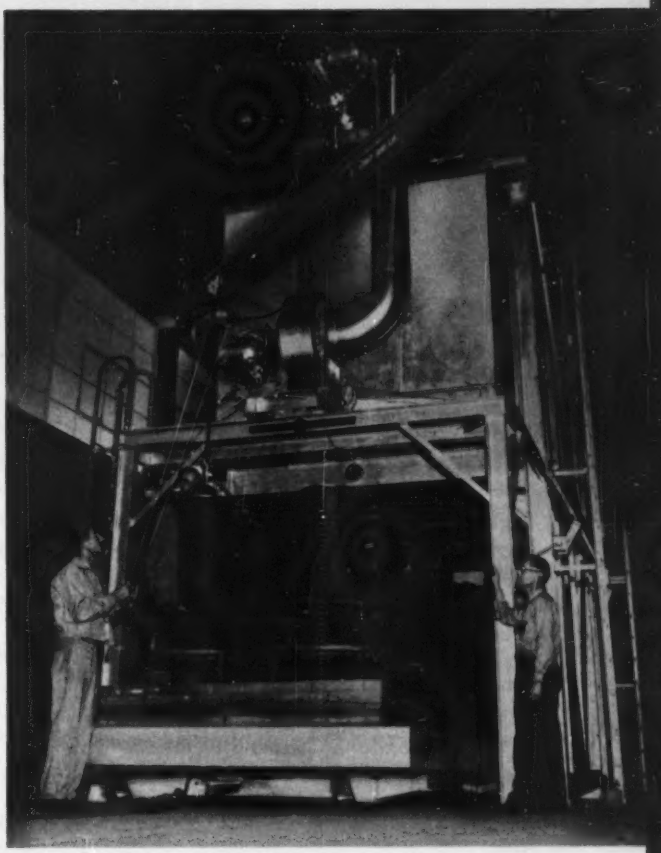


Fig. 1. Ten aft-frames for jet engines are unloaded from a huge G-E electric furnace at the Ryan plant. This furnace is completely automatic with heating, cooling, and atmosphere closely controlled.

Because the furnace is heated electrically, it can be completely sealed without having to dispose of products of combustion. Temperatures, pressures, and atmospheric conditions are completely under the control of the operator. This control also extends to the cooling phase, which is equally important in stress-relieving structures having very close tolerances. Too rapid a cooling cycle could cause residual stresses due to thermal shock, which would be just as harmful as the stresses previously removed by heat-treatment.

The Lindberg continuous furnace shown in

Fig. 2. Ryan rocket motors are stress-relieved in this 52-foot long furnace. Parts are continuously fed through a heating compartment and three successive cooling chambers.

Fig. 2 is designed to perform heating and cooling simultaneously, in separate compartments. Parts are fed into the furnace by means of an endless chain conveyor belt passing over steel drums that are rotated by electric motors. This furnace can be operated at a temperature of 2100 degrees F., and may be used for brazing as well as heat-treating. It is heated electrically by means of Globar heating elements, which are spaced above and below the conveyor in the heating compartment. After passing through the heating chamber, the parts are carried through three successive cooling compartments in which the temperatures and atmospheres are also controlled. Cooling is effected by water circulating through surrounding jackets.

Oxidation is prevented by controlled atmospheres which are generated and pumped through all parts of the furnace. These gases are obtained by partially burning natural gas and passing the products over a catalyst to enrich them in hydrogen and carbon monoxide. Because of the heavy concentrations of these gases, the atmosphere obtained is actually a reducing gas which will remove oxides as well as prevent their formation. When black, oxide-coated steel parts are run through the furnace, they emerge with bright surfaces.

By continually charging this Lindberg furnace with controlled atmospheres, an internal pressure of approximately 2 inches of water is created, thus preventing the entrance of air. Although there are doors at each end, the furnace may be operated with these open. When this is done, fiber-glass curtains are used to prevent the emergence of flames. This furnace is currently being employed to stress-relieve rocket motors.

Because they are substantially larger than other jet-engine components, afterburners posed a special problem in heat-treating. This was solved by means of the large gas-fired furnace shown in Fig. 3, which was built by Industrial Systems, Inc. The design of this furnace incor-

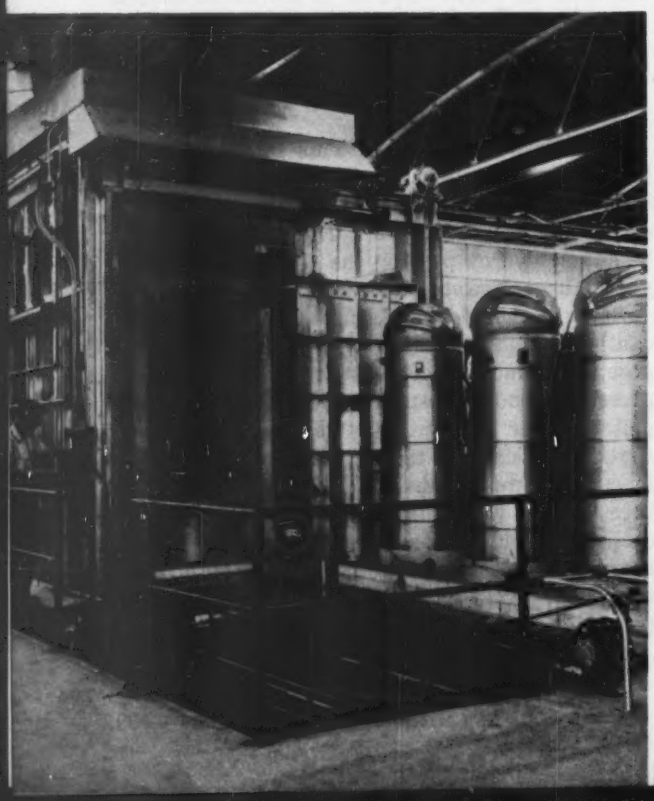


Fig. 3. Large gas-fired furnace especially designed for heat-treating tall afterburners for jet engines. Age-hardening, as well as stress-relieving operations, is completed in this furnace.

porates a number of interesting innovations. To accommodate the tall afterburners, the heating compartment was designed as a large brick-lined structure without a bottom and with a front door entry. In a concrete pit, directly in front of the furnace, two mobile cars can be loaded from adjacent floor-level platforms. By means of a hydraulic piston, these cars are switched from the loading platforms to the center tracks which lead into the furnace. When loaded with three afterburners, one car is rolled under the furnace, thus bringing the afterburners into the heating compartment. Electric motors hoist the car 6 inches and close the heavy steel sliding door to effectively seal the compartment.

Although this furnace does not have a completely controlled atmosphere, satisfactory regulation of atmospheric conditions is maintained through an ingenious combustion arrangement. The gas burners are located along the top sides of the furnace. Air and gas are injected separately in proportioned amounts into a special combustion chamber at the top of the furnace. Only sufficient air for supporting combustion is automatically admitted in order that no excess amounts will be present to cause oxidation. The hot gases are forced down into the heating compartment through slot-like openings in the firebrick ceiling. They circulate through the afterburners, pass through ducts near the floor, and rise in the furnace walls to re-enter the combustion chamber. Pressure in the furnace is maintained at from 1 to 2 inches of water, and excess gas is vented off from the furnace top.

In addition to its use for stress-relieving operations, this furnace is also employed for age-hardening the alloys used in the afterburners. The alloys used for these parts are designed to withstand the extreme temperature encountered in afterburner operation, and attain their maximum strength through heat-treatment. This treatment is deferred until the structure has been fabricated (to render it more ductile for forming), and is then applied together with the stress-relief heat-treatment at a temperature of 1450 degrees F.

* * *

The United States Armed Forces in the Arctic and Antarctic regions make extensive use of aluminum because of the fact that aluminum becomes stronger in sub-zero weather than it is at room temperature.

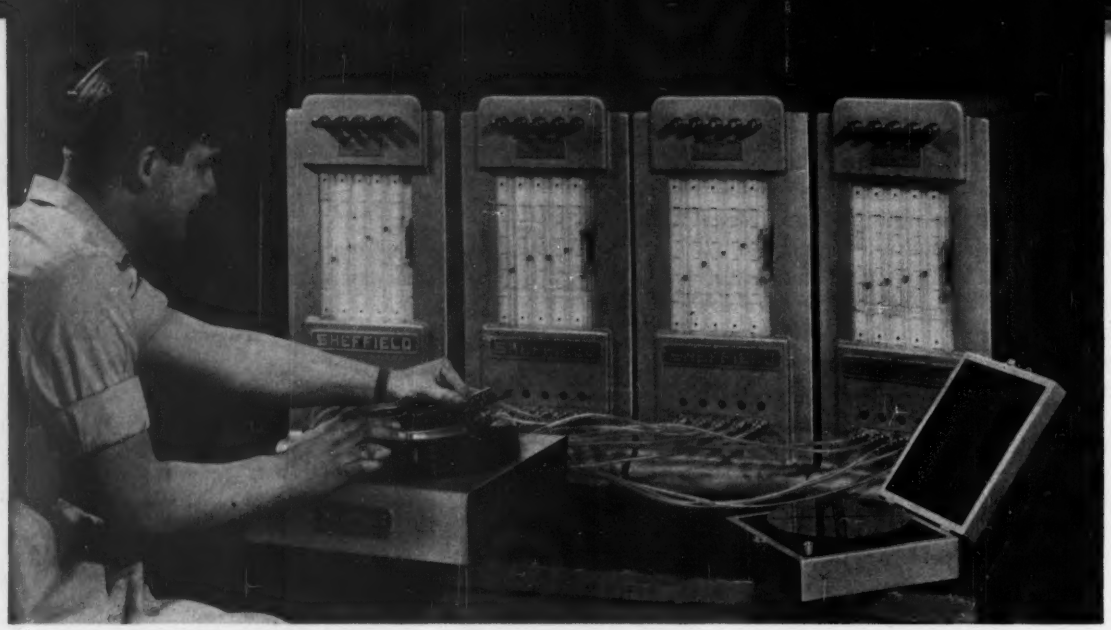
Quick-Action Threaded Clamps for Proof-Testing Cables

Quick-action threaded clamps are being used in the tubing and cable department at Temco Aircraft Corporation, Dallas, Tex., to expedite the proof-testing of aircraft control cables. The pull required to test control cables must be exerted on the threads of the terminals by a turnbuckle or equivalent arrangement. Previous to the development of the new clamp, the threaded terminals were screwed into a turnbuckle, which was then attached to the cross-head of a hydraulic cable testing machine. As many of the cables tested have threaded terminals on both ends, the operation was time-consuming.

The new clamp is made from a 9-inch length of 1 1/4-inch diameter bar stock. At one end, the center of the clamp is slotted, with one side hinged so that it may be opened. A tapped hole in the center of this divided end fits the desired thread. When the threaded terminal is placed on the matching threads, the clamp is closed. A sleeve is then pushed down over the split end to clamp the terminal in place.

Time studies comparing the operation of the new clamp with that of the old method show a saving of approximately twenty-five seconds on each cable tested. Clamps and equalizers are shown in the accompanying illustration being used to test four cables simultaneously.

Fast proof-testing of aircraft control cables is possible with these quick-action threaded clamps. Threaded end of cable is simply placed on matching threads and the clamp is closed.



Theory of Mechanical, Electrical, Electronic, and Air Gaging

Abstract of a Paper Recently Presented at the Annual Meeting of the American Society of Mechanical Engineers by W. Fay Aller, Director of Research, Sheffield Corporation, Dayton, Ohio

SOMEONE has provokingly said that man's forward progress has been marked by his increasing ability to divide the inch smaller and smaller. The worn shilling—the early feeler gage that James Watt couldn't insert between the bore and piston of his steam engine—shows that the division was already starting in 1798. The worn shilling was one extreme. By contrast, today industry requires precision in production in some cases of 0.000005 inch limit (on aircraft fuel injection parts).

Fundamental principles and characteristics of several of the mechanical, electrical, electronic, and air gages that have made today's precision possible will be described in this article. The list is by no means complete, but the examples selected were chosen because they serve to demonstrate the various types. There is no attempt to be complete in describing the circuits as the object is to show principles rather than details.

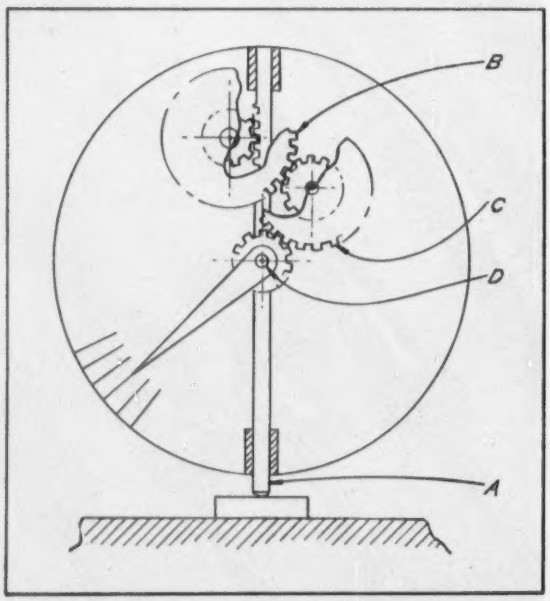


Fig. 1. In this dial indicator, movement of gaging stylus (A) is transferred through pinion assemblies (B) and (C) to pointer shaft (D).

Mechanical Indicating Gages

Mechanical indicating gages employ various methods to achieve amplification of movement. The purpose of this amplification is to translate a minute displacement of a stylus or gage point, resulting from contact with a specimen, into a

value on an indicating scale. It is desirable that this value be quickly and easily read.

Amplifying units in such gages utilize many commonplace mechanical devices, such as simple and compound levers; racks, pinions and gears; spring-steel reed mechanisms; and optical elements, including lenses, prisms, and mirrors. In some cases various combinations of these relatively simple devices are employed to provide a greater degree of accuracy or a higher magnitude of amplification.

Probably one of the most commonly known gages of the mechanical type is the dial indicator, Fig. 1. Essentially this gage consists of a gaging stylus *A* having involute rack teeth on one end meshing with assembly *B*. Rotary motion of this assembly is compounded through assembly *C* to the pointer shaft *D*. Thus amplification of this gage is obtained solely by the ratio of the various pinions and gears, plus the length of the indicating pointer. The scale is arranged radially around the outer periphery of the dial plate. The dial indicator gage, when rigidly mounted on a gage stand or in a fixed position on a gaging fixture, will indicate dimensional deviations of the part being gaged with respect to a reference surface.

Such mechanical indicating devices are manufactured in a variety of amplifications and have a number of advantages. For example, they may be easily mounted on fixtures or used as a simple comparator, and when new or well maintained, have reasonably good accuracy. Also, such gages have an extremely long gaging range relative to amplification.

A second dial type indicator gage, employing 100 per cent mechanical amplification, is shown in simple cross-section in Fig. 2. The pointer *A* is mounted on a twisted strip of metal *B*, the twist of the strip being left-hand on one side of the pointer and right-hand on the other. Elongation of the strip causes it to unwind, thus rotating the pointer. The upper end of the gaging stylus *C* is fastened directly to the horizontal member of the spring knee *D*. The other member of the knee is attached to one end of the strip *B*. The opposite end of the strip is permanently fixed to the frame of the gage. Vertical movement of the stylus causes an elongation of the strip, and the amount of resulting radial movement is indicated on the scale *E*.

This mechanism, while capable of rather high amplification, has a limited range. Being somewhat larger than the usual indicator, it is not easily applied to fixtures but is usually employed as a comparator.

A widely used indicating, comparator type gage embodying combinations of mechanical and optical elements is shown diagrammatically in Fig. 3. The fixed block *A* supports a vertically floating block *C* by means of two horizontal reeds or flat springs *B*. The floating block carries the gaging stylus *D*. Between the fixed block and the floating block are two vertical reeds *E* to which the pointer *F*, carrying the target *G*, is attached. The target intercepts a beam of

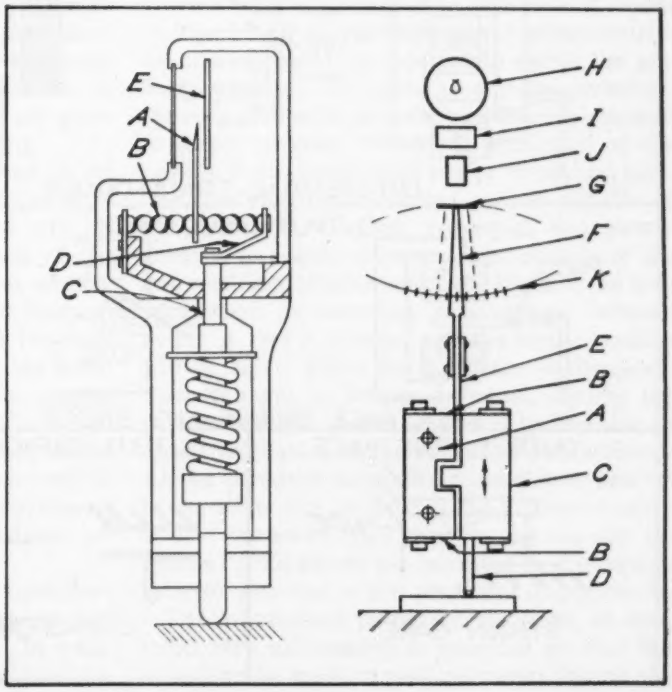


Fig. 2. (Left) Another dial type indicator gage employs 100 per cent mechanical amplification without the use of either gears or pivots.

Fig. 3. (Right) Both optical and mechanical principles are combined in this widely used indicating, comparator type gage having practically no friction.

light initiated by the light source *H* and optical assembly *I* and *J*. The resulting image projected upon the scale *K* indicates, highly amplified, any stylus movement.

Such gages are usually of the bench comparator type because of their size. They have extreme accuracy, speed of response, and fixed amplification. Because of their rugged construction and practically frictionless mechanism, they have a very long life with little maintenance. The mechanical amplification is usually less than 100, but is multiplied by the optical light lever. Gages of this type are available in amplifications ranging from 500 to 20,000.

Instrument and Limit Type Electrical Gages

There are many kinds of electrical gages for dimensional use. Only those systems more commonly used for the inspection of precision metal parts will be discussed, and these can be classified into two general groups:

1. Those which indicate in arithmetical values of dimensional units can be referred to as the instrument type.
2. Those which indicate only whether the dimension is within tolerance, over size, or under size can be referred to as the limit type.

The instrument gages can be classified further by the kind of pick-up head or transducer used. Four general types of electrical transducers are indicated in Fig. 4. No attempt has been made to show exact mechanical arrangement but rather to indicate the principle of operation. Each type shown is characterized by different outputs (voltage, inductance, resistance, and capacitance) requiring, of course, circuits in the auxiliary equipment to handle the particular type and level of output.

In general, the differential transformer transducer (or gage head), shown at the top in Fig. 4, is built in the two types illustrated, *A* and *B*. While the construction is different, the principle is the same. A single primary winding is used in connection with two secondary windings, so that when the armature is mechanically centered, the magnetic flux linking secondary winding No. 1 with the primary is of the same magnitude as that linking winding No. 2 with the primary. Under such conditions, the voltages induced in the two secondary windings are equal. Movement of the armature in either direction from this position causes an unequal distribution of magnetic flux in the two paths, resulting in the voltage increasing in one secondary and decreasing in the other in proportion to the mag-

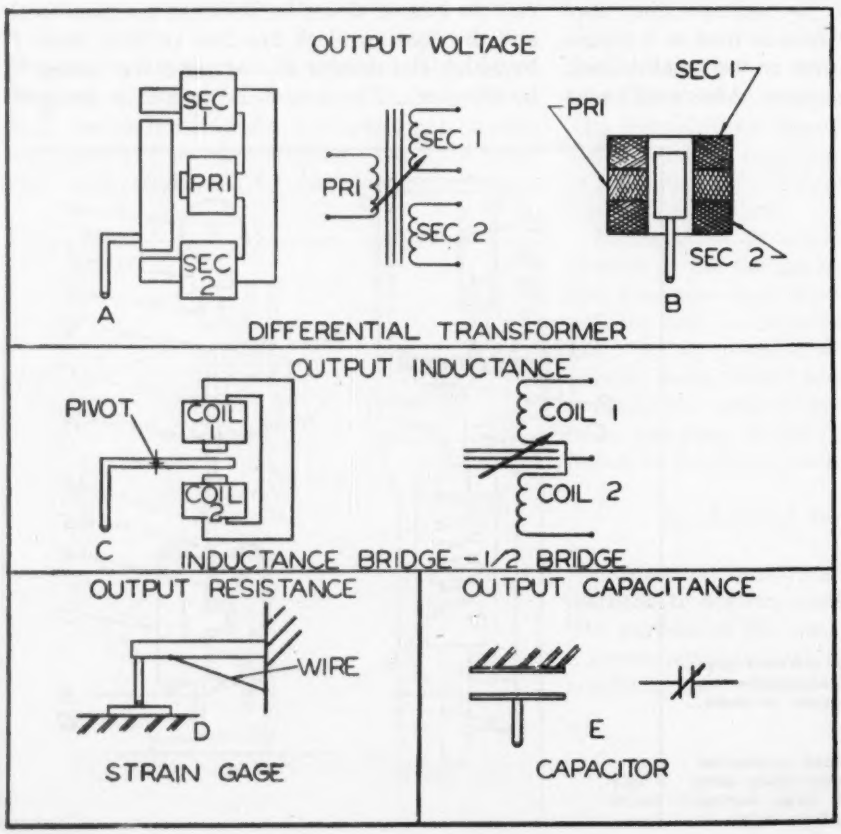
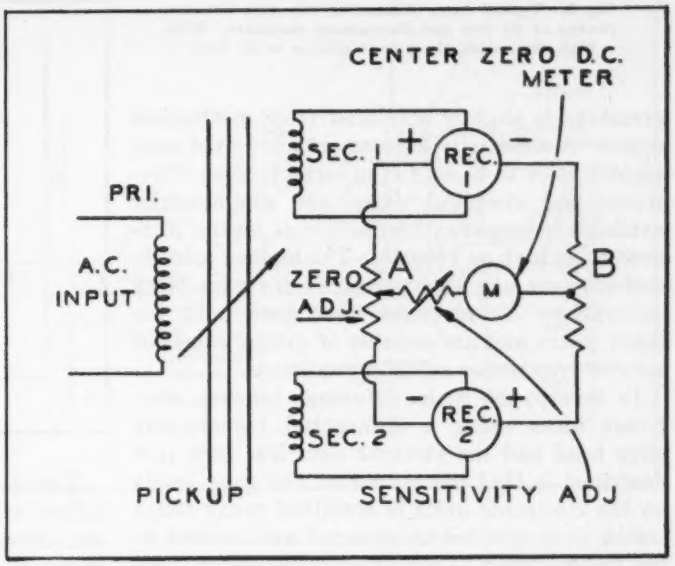


Fig. 4. Four general types of electrical transducers are the differential transformer, inductance bridge, strain gage, and capacitor, having voltage, inductance, resistance, and capacitance outputs, respectively.

Fig. 5. Simplified, non-electronic circuit for a differential transformer type gage head. Rectifiers change the output of secondary windings to direct current.



nitude of movement. Movement from the neutral position in the reverse direction results in just the opposite distribution of voltage in the two secondary windings. With a proper circuit the indicating meter can be made to show plus and minus directional movement from center in addition to magnitude. The main difference between differential transformer arrangements *A* and *B* is that the flux paths in *A* are primarily in iron, while in *B* they are mostly in air.

Arrangement *C* (inductance bridge) is based on the change of inductance of two coils as an armature is pivoted between the two pole faces. As this armature is moved from its center position, the inductance of the two coils varies in approximately inverse relation to the air gaps, one increasing and the other decreasing.

Arrangement *D* (strain gage) is based on the change of resistance of a metal wire as it is placed under a strain. Its resistance will increase as the wire is stretched because of the increase in length and decrease in cross-section. Also, in certain materials not used for comparator applications, the resistance will increase, because of the change in resistivity of the metal occasioned by molecular strain. The gaging stylus is used to stretch the wire, which is usually a special alloy whose resistance is very stable against temperature changes. Arrangement *E* (capacitor) is based on the change of capacitance of a parallel plate condenser as the distance between the plates is varied.

The first three transducer arrangements are probably the most popular, and, in general, are characterized by very good stability. In addition, arrangements *A* and *C* can be designed for high output so that electronic amplifiers are not required. The other transducers have such low output that amplifiers are necessary. The general trend is toward the use of electronic amplifiers with all types of transducers because of the flexibility and high amplification possible. For stability reasons it may be necessary to design the transducer for small output even though the type is capable of high output. Capacitor types of transducers, such as the one shown at *E*, are not in general use.

A simplified, non-electronic circuit for the differential transformer type gage head is shown in Fig. 5. An alternating-current power source, usually regulated, is required to excite the primary winding. By means of dry-disc rectifiers, the output of each secondary winding is changed to direct current. When the armature of the gage is in the mechanical center or neutral position, the alternating-current voltage outputs of the secondary windings are equal, and, consequently, so are the direct-current outputs of the two rectifiers. Under such conditions, if the zero adjustment is centered, the voltage between points *A* and *B* is zero, and the meter reading will be zero. When the armature is displaced, these voltages no longer are equal, causing the voltage between points *A* and *B* to increase in direct proportion to the armature displacement. As the armature moves from one side of neutral to the other, the polarity of the voltage changes so that the meter then reads in the opposite direction. This allows the operator to distinguish between plus and minus armature displacement.

For convenience in setting the gage, an electrical zero adjustment is provided so that the meter can be made to read zero even though the

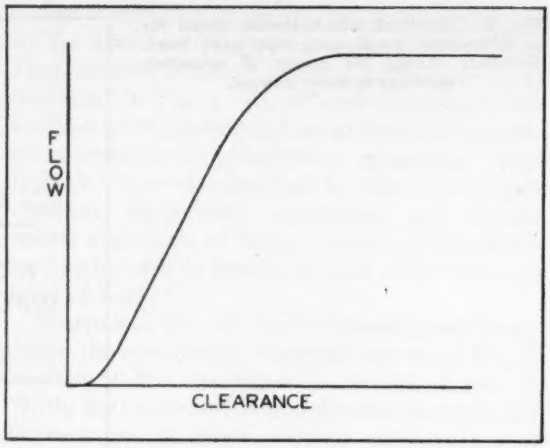


Fig. 6. Typical curve illustrating the ratio between change of air flow and dimensional clearance. With high clearances, there is no change in air flow.

armature is slightly displaced from mechanical center. A sensitivity adjustment allows the gage amplification to be set to the correct value. Electronic and electrical gages are commercially available in amplifications as low as several hundred to as high as 100,000. The highest amplification gages are used primarily for gage-block calibration. These gages have been built for many years and are capable of giving excellent service even under adverse conditions.

In theory, the main difference between electronic units using a differential transformer gage head and the straight electrical type just described is that the output of the gage heads on the electronic units is amplified many times before it is rectified or detected and applied to the meter circuit. Limit gages, the second general class of electrical gages are used primarily for semi-automatic types of gaging. These gage heads are essentially sensitive limit switches. In fact, where very high sensitivity is not required, precision limit switches have actually been employed as gage heads.

Pneumatic Gages Measure Flow or Pressure of Air

An air gage is basically a comparator gaging device that utilizes the effect of minute dimensional changes on metered air in a gaging circuit. There are two different approaches to measuring the metered air. One method is to measure the flow of air that is metered through the orifice. The other measures the variations of pressure in the gaging circuit.

The flow of air that is metered through an orifice with an obstruction plate in front of it will change as the clearance from the metering orifice to the obstruction plate is changed. A typical curve illustrating the change in flow per increment of dimensional change or clearance is shown in Fig. 6. It will be noted that the first small dimensional clearance indicates no flow. As the clearance in increased, the change of flow per unit of dimensional clearance increases. At a certain point the change in flow becomes uniform with the change in clearance and remains so for a definite range. When this range is passed, the change in flow gradually decreases per increment of dimensional clearance until there is no flow change.

The straight portion of the curve is the range in which all dimensional measurements take place. The actual length of the straight portion of the curve and its starting point depend on two factors, namely, the orifice size and the air pressure at the orifice.

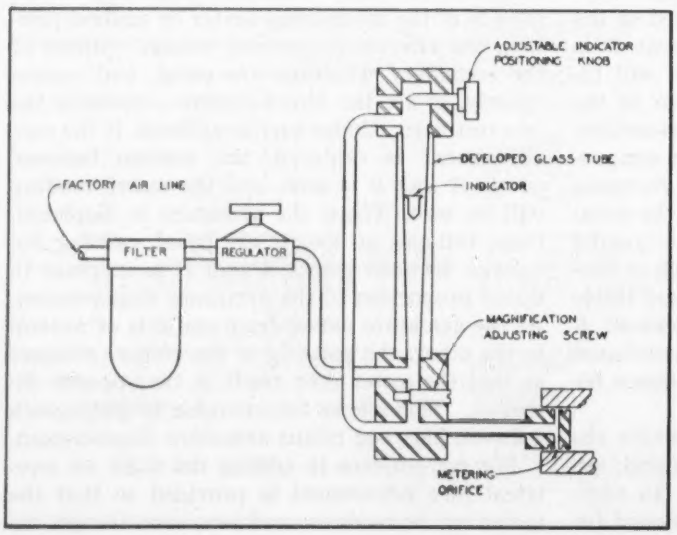
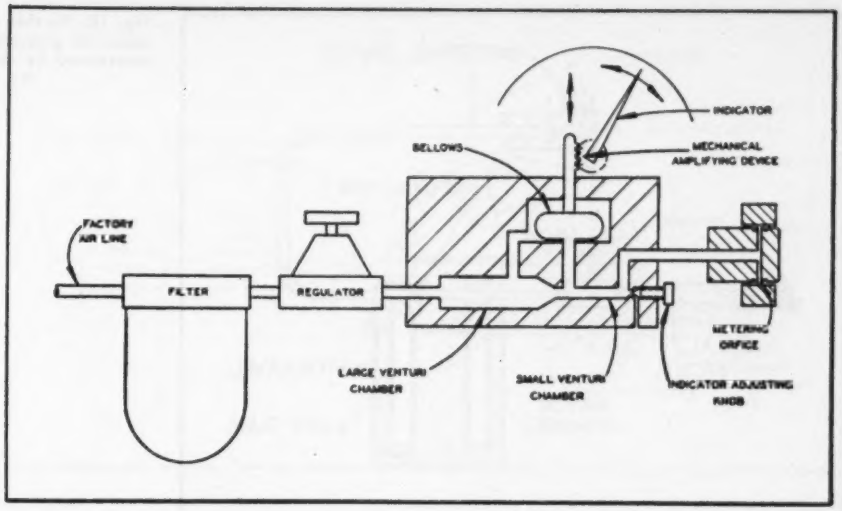


Fig. 7. Air gage based on the flow principle of measurement. Indicator floats in a cone of air passing through a glass column having a tapered bore.

Fig. 8. In this type of gage, filtered and pressure-regulated air enters a large Venturi chamber that converges into a smaller Venturi chamber.



An air gage utilizing the flow principle of measurement is shown in Fig. 7. Briefly, this gage consists of an indicator that floats in a cone of air passing through the tapered bore of a glass column prior to escaping from the metering orifice.

Air from a factory line is passed through a filtering element, a regulator for precisely controlling pressure, a tapered bore glass tube in which the indicator floats, and then through the metering orifice. The amplification of the gage is approximately controlled by the amount of taper in the bore of the tube. Two adjustments have been provided for setting the amplification. One is an atmospheric bleed knob which positions the floating indicator. The other is a magnification adjusting screw for changing the amplification. Two masters are used for setting the amplification.

This principle allows a wide range of amplifications—a 50,000 amplification being available without the use of accessory equipment. Since the flow principle is employed, the measuring nozzle may be at a considerable distance from the instrument without perceptible loss of speed of indication. The vertical tubes may be conveniently grouped for observing a number of dimensions simultaneously.

Another style of air gage, Fig. 8, uses the Venturi principle. Air passes through a filtering element, a regulator for controlling pressure, into a large Venturi chamber that converges into a smaller Venturi chamber, and on through the metering orifice. Each chamber of the Venturi has a pressure tube connected to opposite sides of a bellows. The low-velocity air, passing through the larger Venturi, creates a higher pressure on one side of the bellows than the higher velocity air passing through the smaller Venturi chamber creates on the opposite side.

The difference in pressure causes the bellows to move until the spring pressure from the bellows plus the lower pressure in one chamber is in balance with the higher pressure on the other side of the bellows. The deflection of the bellows is then measured by a mechanical amplifying device similar to a dial indicator. The amplification may be varied by changing the diameters of the Venturi chambers. The greater the difference in diameter, the greater the amplification. In general, the diameter of the smaller Venturi chamber is from 25 to 50 per cent of the diameter of the larger.

There are also two adjustments provided on this type gage for setting the amplification. One is an atmospheric bleed for positioning the indicator, the other a pressure regulator for ad-

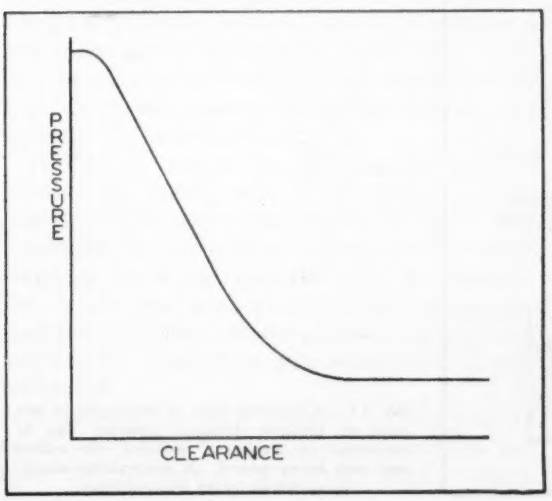


Fig. 9. Typical curve illustrating the ratio between change of air pressure and dimensional clearance. With high clearances, there is no change in pressure.

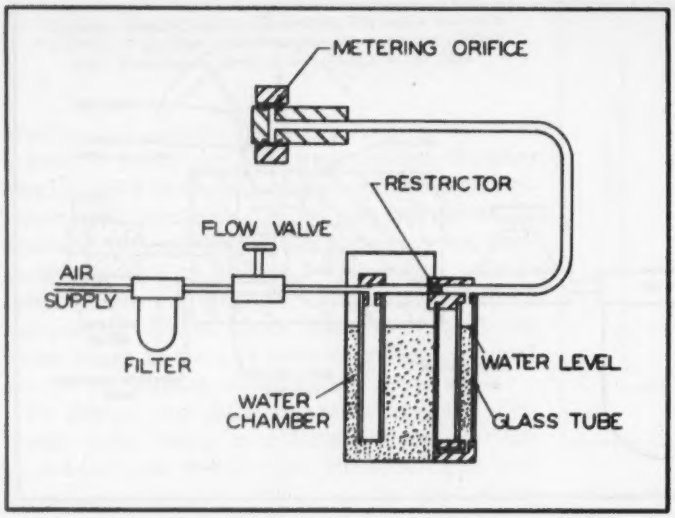


Fig. 10. In this water-column, back pressure gage, air pressure is maintained constant as determined by the height of the column in the water chamber.

justing amplification. Two masters are used to set the amplification.

The back pressure created by placing the obstruction plate near an orifice causes a pressure change in the downstream side of the restricted air circuit. A typical curve showing the pressure change with relation to the dimensional or clearance change in such a set-up is shown in Fig. 9. With the first small dimensional change there is no pressure change. As the clearance increases, the change in pressure per unit of dimensional clearance increases. At a certain point, the change in pressure per unit of dimensional clearance change becomes uniform and remains so for a definite range. Subsequently, the change in pressure per unit of dimensional change decreases until there is no pressure change. The starting point and the linear range depend on the amount of amplification, the size of the orifice, and the pressure range of the orifice.

The water column gage, Fig. 10, utilizes air from a factory line that passes through a filter, a flow valve, a water chamber, and a restrictor, and escapes from the metering orifice. The air pressure is maintained at a constant value as determined by the height of the column in the water chamber. The restrictor meters the air into the gaging circuit, and the water column registers changes in pressure caused by variations in orifice clearance. Two masters are used to set the amplification.

A bourdon tube or bellows in a restricted air

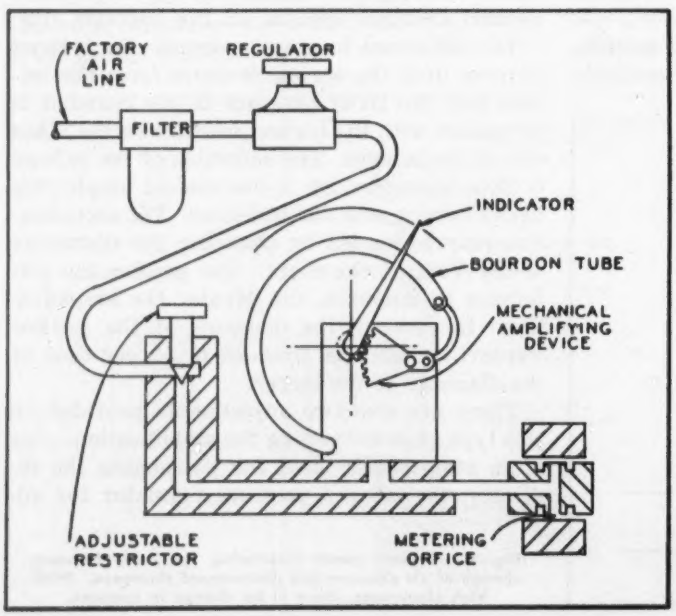
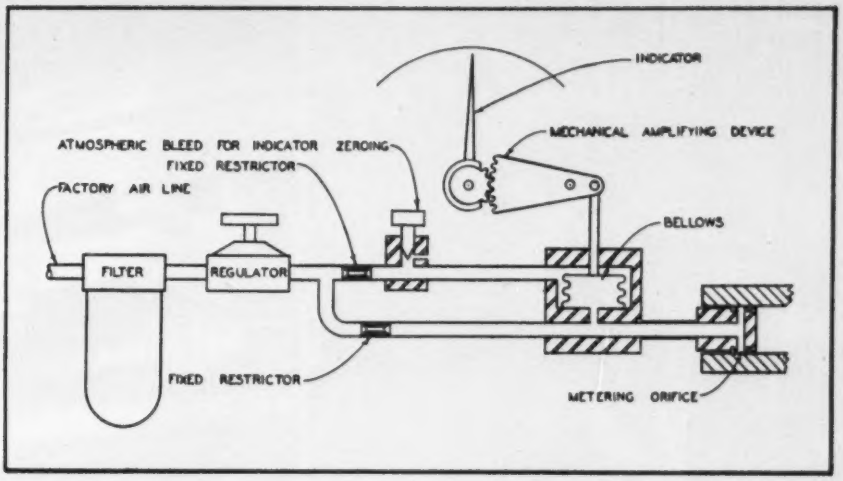


Fig. 11. A bourdon tube is employed in this gage to indicate pressure changes due to variations in clearance between the orifice and part being gaged. A mechanical amplifying device turns the indicator.

Fig. 12. In this differential gaging circuit, air passes through two separate channels, one connected to each side of a bellows. The movement of the bellows is mechanically amplified.



circuit is used in another type of back pressure gage, shown in Fig. 11. Air from the factory line again passes through a filter, a regulator for controlling pressure, a restrictor for metering the air, and into the gaging circuit. A bourdon tube has been placed in this circuit to indicate pressure changes due to variations in the clearance between the orifice and the part being gaged. The pressure changes in the bourdon tube cause it to deflect, and these deflections are amplified by a device similar to the mechanism of a dial indicator. Two adjustments have been provided to set the amplification. One is the regulator for varying air pressure, and the other, the restrictor for altering the amount of air that is metered into the gaging circuit. Two masters are again used for setting the amplification.

A differential circuit using a bellows is another type of back pressure gage (Fig. 12). Air from the factory line passes through a filter and a regulator for controlling the pressure. The air then passes into two separate channels, one of which has a fixed restrictor, an atmospheric bleed for indicator zeroing, and terminates in a cavity containing the bellows. In the other channel, the air passes through a fixed restrictor into a cavity on the opposite side of the bellows, and through the metering orifice.

In this air circuit the difference in pressure between the zeroing side of the circuit and the gaging circuit causes the bellows to move. The movement of the bellows is then mechanically amplified by a dial indicator type mechanism. One master has been provided for use in conjunction with the zeroing adjustment, and two masters are required to determine or check amplification.

In general, the back pressure circuits provide speed of gaging when the gaging nozzles are near the instrument. However, gaging which requires remote location of the nozzles from the instrument, or the use of a higher range of amplification, seriously retards this speed.

Satisfactory air gages are available in all of the various circuits described and a choice may be made to satisfy particular requirements. Considering that practical air gaging has been in use only a little over a decade, wonderful progress has been made. Because of its adaptability to difficult gaging problems, its growth in popularity has been very rapid. Its usefulness is particularly outstanding in the field of multiple gaging. Air gaging can also be combined to great advantage with electric and electronic gaging devices.

There is no intention to convey the impression that the development of new gaging methods make obsolete the older proved methods. Rather they augment and supply a greater number of approaches to gaging problems, allowing use of the one best suited for a particular need.

* * *

Better Piston-Rings

Latest tests conducted on the performance of piston-rings for gasoline and Diesel engines indicate that those made of Ductile Iron, a material developed by the International Nickel Co., have wear resistance approximately one-third better than those made of the best grades of gray iron which are normally used for this application. In addition, these new rings have greater spring tension, which makes them fit more snugly against the cylinder wall. These new features already have solved difficult problems in certain types of high-speed engines, and offer broad possibilities of improving the performance and economy of the internal combustion engine.

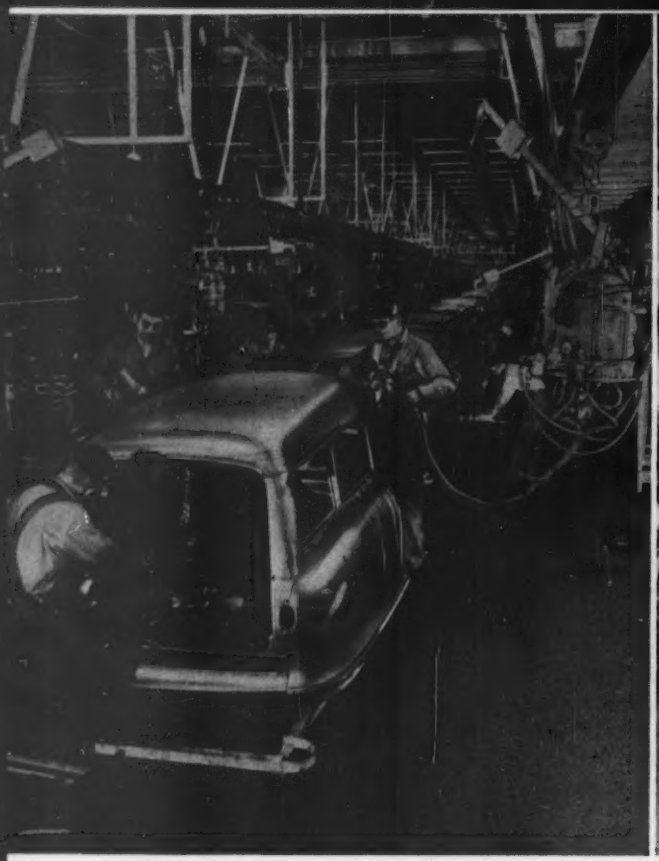


Fig. 1. Lincoln welding machines are suspended from monorails which are parallel to the framing conveyors and permit the machines to move along with the bodies until the welding operations are completed.

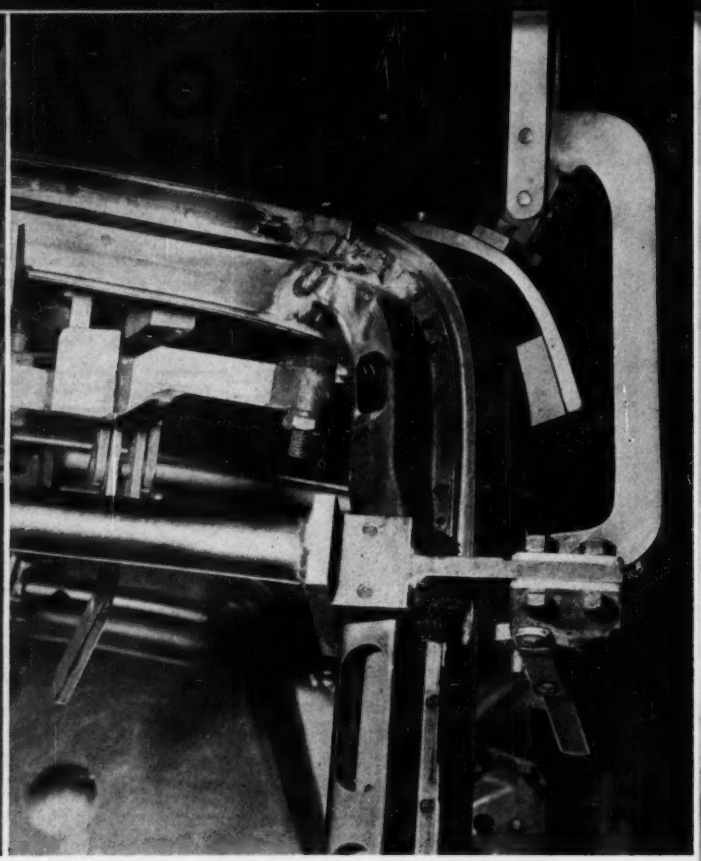


Fig. 2. View showing arc welds of the roof rail to the rear opening header above the left gate. The box construction of the rail and header makes the area inaccessible for performing spot-welding operations.

Arc-Welding the Nash "Rambler"

Arc Welding Plays a Key Role in the Well-Known "Unitized" Construction of the Body and Frame of Nash Automobiles. Proving Ideal Both in Its Adaptability to Model Changes and Suitability to Hard-to-Reach Locations, Arc Welding Supplements or Replaces Traditional Spot-Welding Methods of Fabrication. Here are Some Illustrated Highlights of Arc-Welding Operations Performed with Lincoln Equipment on the "Rambler" Station Wagon at the Nash-Kelvinator Plant in Kenosha, Wis.

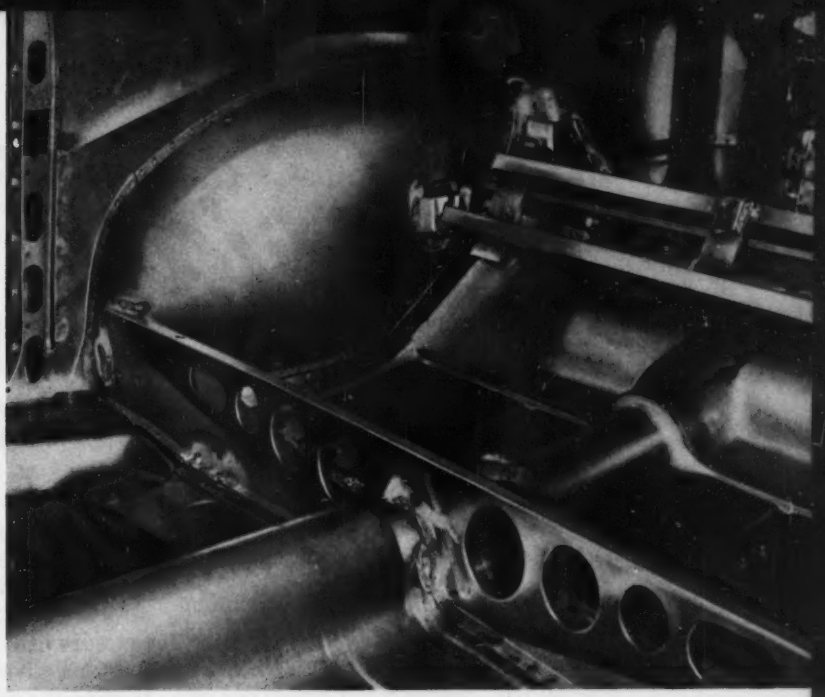


Fig. 3. The rear compartment cross-member with lightening holes is also the rear-seat riser. It is arc-welded to the floor-pan and to the inner side of the rear wheelhouse.

Fig. 4. Arc welds below the cowl fasten the front-hinge pillar filler to the dash panel and pillar. Dash panel, toe board, and front floor-pan are arc-welded to the outer wheelhouse panel.

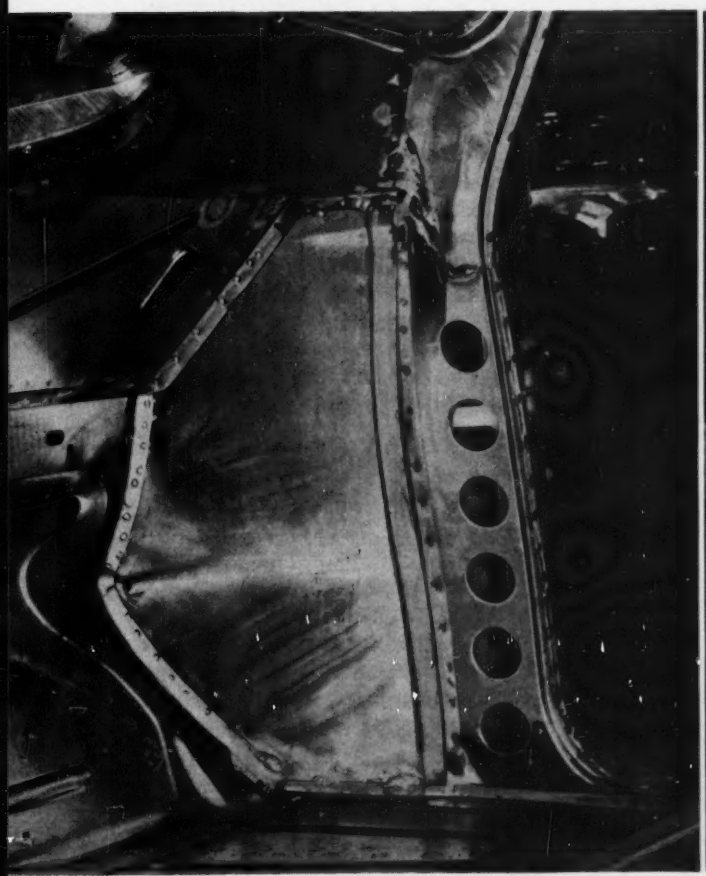
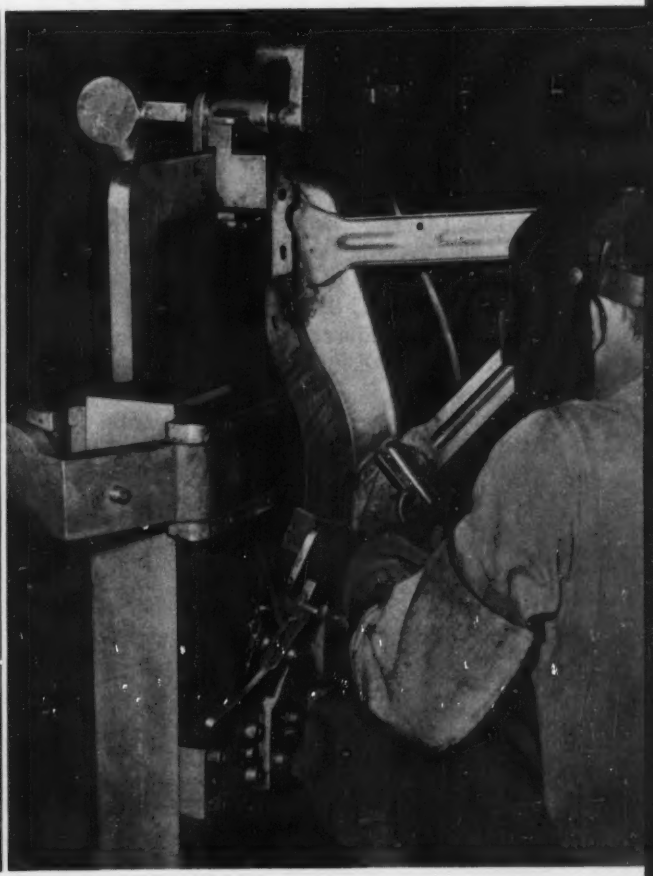


Fig. 5. Completing the arc-welding of the front cross-member to the front inner wheelhouse panel and body-sill extension. Certain of these welds serve to reinforce previously made spot welds.



Materials OF INDUSTRY

The Properties and New Applications of Materials Used in the Mechanical Industries

Aluminum Alloy Developed for Taking Brilliant Finish

An aluminum alloy that will take a brilliant Alumilite finish has been developed by the Aluminum Company of America, 801 Gulf Bldg., Pittsburgh 19, Pa. When Alcoa C57S—as the alloy has been designated—is Alumilite-treated, it approaches highly pure aluminum in transparency, metallic luster, and the sheen of its finish. It has excellent forming characteristics, and in the treated condition can be used as a replacement for chromium and stainless steel in automobile or refrigerator trim and giftware.

Larger Sizes of Seamless Light-Wall Tubing Introduced

An increase in the size range of seamless light-wall tubing from 1 1/4-inch outside diameter to 2 1/16-inch outside diameter, has been announced by the Superior Tube Co., 1547 Germantown Ave., Norristown, Pa. This large-diameter tubing is furnished in three stainless analyses—AISI Types 304, 321, and 347—and in Monel metal. It is produced with a pickled or standard bright finish and in three tempers: No. 1, fully annealed; No. 2, half-hard drawn; and No. 3, full-hard drawn. Length range is from 5 to 22 feet in random, multiple, or cut lengths.

Wall Thicknesses of "Superior" Tubing

Outside Diameter, Inches	Minimum Wall Thickness, Inch	Maximum Wall Thickness, Inch
Up to 7/8, incl.	0.006	0.035
1	0.007	0.035
1 1/8	0.008	0.035
1 1/4 to 1 3/8, incl.	0.010	0.035
1 1/2 to 2 1/16, incl.	0.010	0.025

Standard outside diameter tolerances are + 0.005, — 0.000 inch on tubing up to 1 1/2 inches, and + 0.010, — 0.000 inch on tubing 1 1/2 to 2 1/16 inches. Wall thickness tolerance is ± 0.010 inch on all sizes.

Present applications for large-diameter seamless tubing include bellows for industrial and aircraft instruments, flexible metal hose for the aircraft, food, and chemical industries, and low-pressure heat exchanger tubes. The accompanying table gives the minimum and maximum wall thicknesses for various sizes of tubing.

Multiple-Purpose Lithium Grease with High Resistance to Breakdown

High resistance to breakdown is one of the basic characteristics of Shell Alvania Grease, a lithium-base product which has been made available by the Shell Oil Co., 50 W. 50th St., New York 20, N. Y. This grease has a high water tolerance (up to 32.5 per cent without loss of lubricity), a broad operating temperature range, a high pumpability (for automatic grease systems), and movement at low temperatures. It has a low rate of oxidation and excellent storage stability. By incorporating this range of properties in a single grease, purchasing is simplified and storage space is saved. Furthermore, chances of misapplication are reduced.

Electrolytic Alkaline Derusting and Descaling Process

The employment of an alkaline electrolytic process to derust and descale metals, has been announced by Enthone, Inc., Department M, 442 Elm St., New Haven 11, Conn. The material used for this process is called Enthone Compound 134.

The derusting and descaling are accomplished by the use of periodic reverse current acting in conjunction with the compound. This enables the clean removal of black heat-treat quenching and other scales on alloy-steel parts, as well as the removal of any carbon smut. The base metal is not attacked, and the process produces a surface for hard chromium-plating with little danger of hydrogen embrittlement.

Bulk descaling of small parts has been successfully accomplished in oblique tumbling barrels using a carbon electrode. Current densities ranging anywhere from five to several hundred amperes per square foot can be used.

Extreme-Pressure Lubricant for Industrial Gearing

A lubricant which keeps mating gear surfaces separated under heavy loads has been developed by the Sun Oil Co., Philadelphia 3, Pa. Sunep, as it is called, is a lead naphthenate type extreme-pressure lubricant which is available in several viscosities ranging from 300 to 3000 Saybolt seconds at 100 degrees F. It is non-corrosive, has long life, acts as a rust preventive, and adheres well to the gears.

This lubricant is suitable primarily for enclosed gears, but it has proved effective for plain bearings and screws working under extreme pressures. Sunep is further used in gear-reduction units driving rolling mills, strip-mill reel drives, rubber mills, calenders, and conveyors, as well as in screw-down mechanisms on calenders and rolling mills and in plain bearings on tilting mechanisms.

Cleaner for Aluminum, Tin, and Other Soft Metals

A cleaner has been developed by Oakite Products, Inc., 126 Rector St., New York 6, N. Y., to safely clean aluminum, tin, and other soft metals. It is called Oakite Composition No. 80-A, and has wide applications on a variety of work in aircraft and metal plants where good cleaning ability and thorough safety in use are essential. The composition may be used in soak tanks or pressure spray washing machines. It is readily soluble in hot water, and rinses off with hot or cold water.

Bonding Agent Joins Dissimilar Metals and Non-Metallic Products

ChemoTec—formulated for joining metals to each other, to dissimilar metals, and to non-metallic materials such as ceramic, glass, or wood—has been made available by the ChemoTec Division of Eutectic Welding Alloys Corporation, 172nd St. and Northern Blvd., Flushing, N. Y. Use of the bonding agent (available in rod, powder, paste, and liquid forms) is claimed by the manufacturer to be a new method of production joining of titanium, magnesium, aluminum, and similar difficult-to-bond metals.

High-Nickel Alloys Rolled to Extremely Close Tolerances

High-nickel alloys rolled to precision tolerances and very thin gages, for use throughout industry, are now available from the Industrial Division, American Silver Co., Inc., 36-07 Prince St., Flushing 54, N. Y. These metals are rolled in strip form up to 8 inches wide and as thin as 0.0005 inch, to tolerances as close as plus or minus 0.0001 inch. Characteristics of these alloys include temperature compensation, low expansion, high permeability, and electrical resistance.

Typical uses for these metals are speedometers in the automotive industry, navigation instruments in the aviation and marine industries, and telemetering devices in the electric light and power industry.

Two Product Cleaners for Use at Room Temperature

Two cleaners that can be used effectively in power washers at room temperature have been announced by E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

One of the cleaners called Houghto-Clean 439, is an oily liquid combining active organic wetting agents, detergent and rust inhibitor; the other, Houghto-Clean 440, is a white powder composed of balanced alkalies, containing no caustic or carbonates. Water solutions of these two cleaners, when mixed, form a solution which serves to passivate the surface of metal parts, providing rust protection in temporary storage. Uses include the removal of drawing oils, pigmented compounds, sulphurized cutting oils, rust preventives, and soils.

Heat-Resisting Alloys Developed with High-Strength Qualities

New high-strength heat-resisting alloys needed for military jet engines have been developed which can be placed under great stress and used where temperatures are well over 1000 degrees F. The base metals are nickel, cobalt, and iron, which comprise 65 per cent or more of the alloys by weight.

These alloys are made in electric furnaces in the manner used to make stainless steels. A total of twenty-two elements are used in their manufacture, and as many as twelve elements are included in the compositions of some of them. They are now used largely in military jet engines, but will have numerous civil applications, such as in commercial airplane engines and improved gas turbines.

Designing Hopper Feeds for Bottle Caps

Third in a Series of Articles Describing Different Types of Mechanisms for Automatically Feeding a Continuous Line of Bottle Caps to Production Machines

By JOSEPH and VINCENT WAITKUS

THE bottle-cap feeding mechanism shown in the illustration on the opposite page is known as the quarter-turn chute rectifying hopper. It has been widely applied and is considered one of the best types now in use, being an improvement over the one described in January MACHINERY, page 176. The convex disc *B* is kept in rotation at a moderate speed in the housing *A*. The disc is supported by a thrust bearing *F*. A bronze bushing *G* serves as a bearing for the main shaft *E*, to which the disc *B* is fastened.

Four buttons *D*, forced into the disc *B*, serve to agitate the caps until centrifugal force carries them to the inner side of the housing, where they take a vertical position in the annular slot *W*. The caps pass from slot *W* down through the opening *Z* into the rectifying chute *C*, where they encounter the two ribs *Y*. These ribs separate the caps facing in opposite directions into two separate lines, which make a quarter-turn so that all the caps will face the same way.

When the caps reach the collecting chambers *Q*, they are checked between the oscillating finger *U* and the gate fingers *J*. The oscillating finger receives its motion from a cam *K* attached to the main shaft *E*. A pin *L*, fastened to the slide *M*, fits into the cam groove. The slide *M* is connected to the rocker arm *P* by the connector *N*. The rocker arm and the oscillating finger are both attached to the pin *R*. The two gate fingers *J* are pivotally mounted on pins *S* and are held together in a closed position by the spring *T*.

As the finger *U* moves to one side, it causes the caps and the gate finger *J* to be pushed outward. The spring *T* is stretched since the opposite gate finger cannot enter into the collecting chamber. The movement of the finger *U* to one side opens up a space big enough for the caps to pass down to the chute *V*. Therefore, the discharge of caps is controlled by the finger *U* oscillating back and forth and releasing caps first from one side of the collecting chamber and then the other.

This hopper is considered very efficient. The principle on which it operates is simple and most important of all, it has practically eliminated the scratching and mutilation of the caps. The one criticism of this mechanism is directed toward the rectifier chamber *C*, where the caps make a quarter turn. This chamber is difficult to make and it must be very carefully designed in order to provide a smooth flow of caps into chute *V* at the lower end.

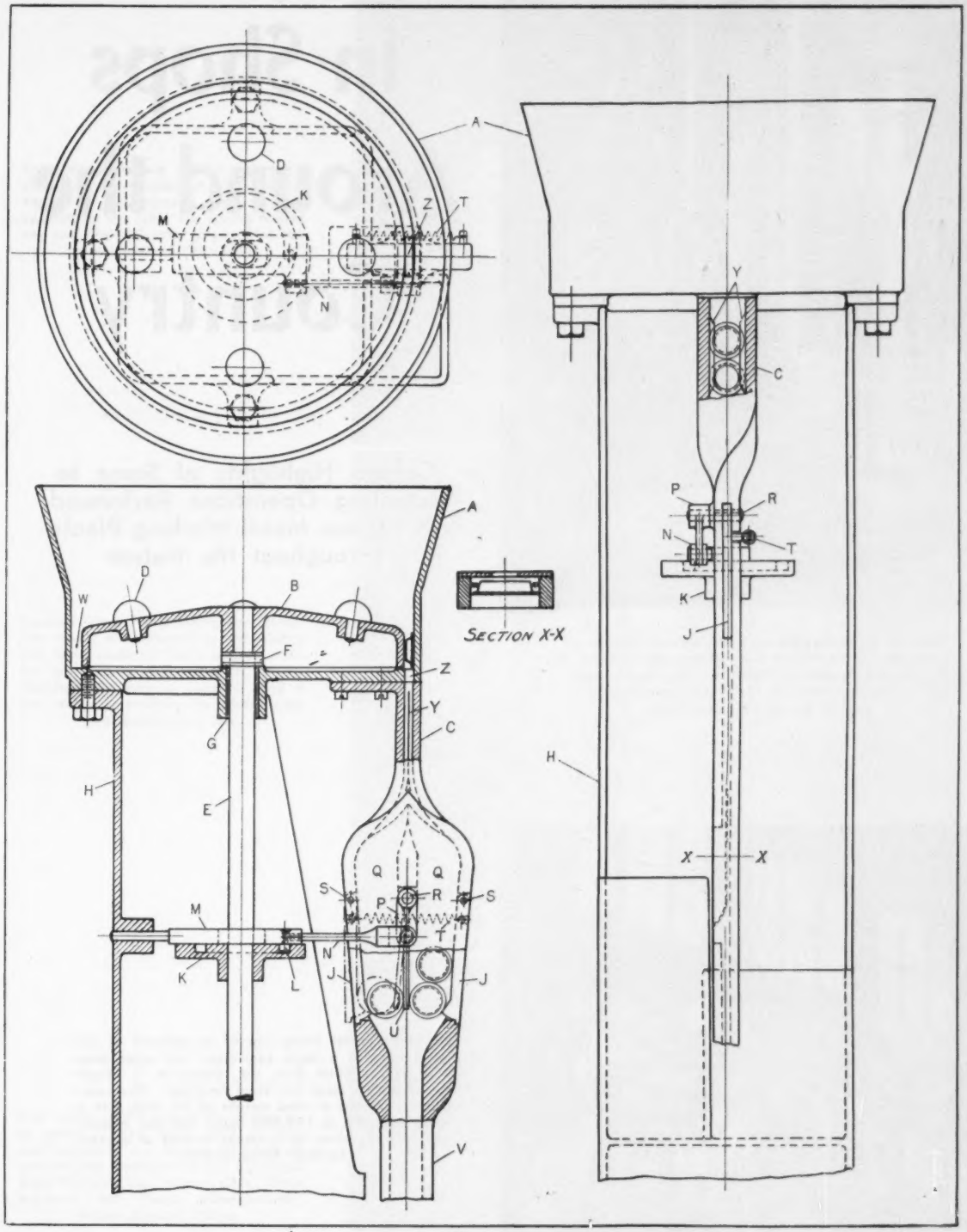
In the fourth article of this series, which is to be published in a coming number of MACHINERY, a feeding mechanism will be illustrated and described in which the bottle caps are handled by a simple double-escape rectifying hopper that takes the place of the more complicated design of rectifier chamber mechanism illustrated in the present article.

* * *

World's Largest Scrap Handling System

Two hundred and fifty tons of metal scrap can be handled per day by means of equipment installed in the Grand Rapids Plant No. 1 of the Fisher Body Division, General Motors Corporation. The feature of this system is a 4 1/2-foot wide main conveyor which has a total length of 1144 feet. The normal carrying capacity of this conveyor is 40 pounds per linear foot and the conveyor belt can travel at various speeds up to 45 feet per minute.

Twenty collecting conveyors which range from 61 1/2 to 165 feet in length travel at right angles to the main conveyor under rows of presses. They receive scrap from chutes located under presses on the floor above, and carry this scrap to the main conveyor. The baler compresses loose scrap into a bundle averaging 24 by 16 by 16 inches in size and weighing between 600 and



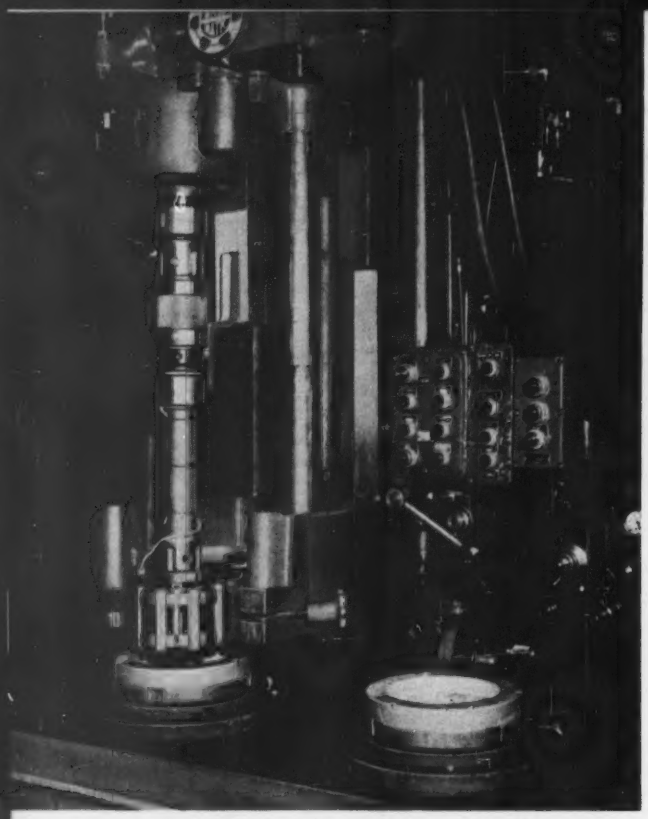
Bottle-cap feeding mechanism with quarter-turn chute rectifying hopper which is so designed that the delivered caps all face the same way

800 pounds. Each bale is ejected onto a 4 1/2-foot wide conveyor.

This unique scrap handling system, which is believed to be the largest in the world, was conceived and originally designed by the Central Works Engineering Division of Fisher and constructed by May-Fran Engineering, Inc., of Cleveland, Ohio.

In Shops Around the Country

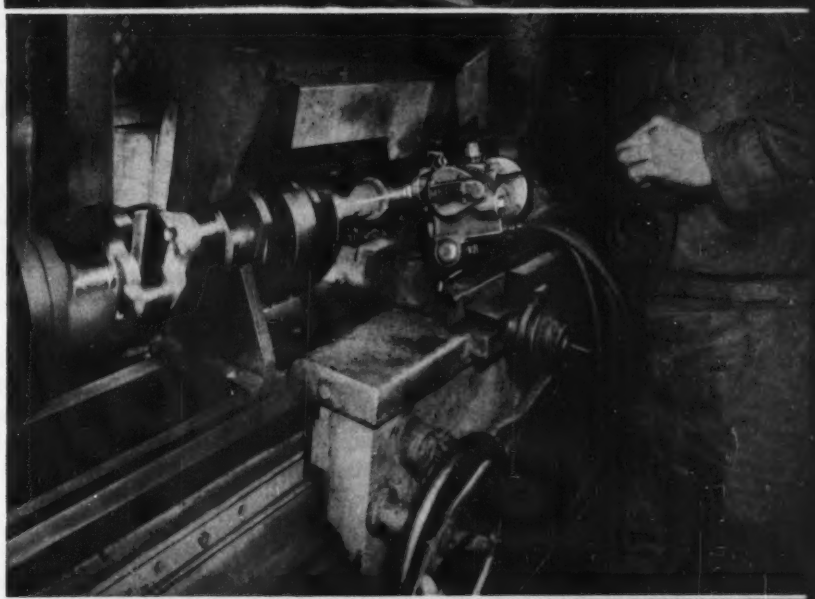
Camera Highlights of Some Interesting Operations Performed in Various Metal-Working Plants throughout the Nation



Bores of aircraft-engine cylinder barrels manufactured by Curtiss-Wright Corporation, Wood-Ridge, N. J., are automatically honed to the required size by "Microsize" control. Two bars gage the bore during the honing operation.

Four-stage rotor being placed in position in the lower case of a huge centrifugal air compressor built by the Clark Bros. Co., Olean, N. Y. Shaft and impeller discs are steel forgings. The compressor, having a total weight of 70 tons, has a rated capacity of 100,000 cubic feet per minute, and will be driven by a steam turbine of approximately 8000 B.H.P.

Dynamic balancing of the assembled rotor for the compressor shown at the bottom of the opposite page. Rollers supporting the rotor are spring mounted, and dial indicator gages show the movement of the rotor.



Salvage time for building up undersize areas of automotive crankshafts has been reduced from one hour to ten minutes, or less, per shaft. High-molybdenum wire is sprayed with a gun manufactured by the Metallizing Engineering Co., Inc.

Tail cones, which control the discharge of exhaust gases from J-47 jet aircraft engines, are formed on a Reed cone-rolling machine at the Firestone Steel Products Co., Akron, Ohio. This machine has three independently driven conical rollers.

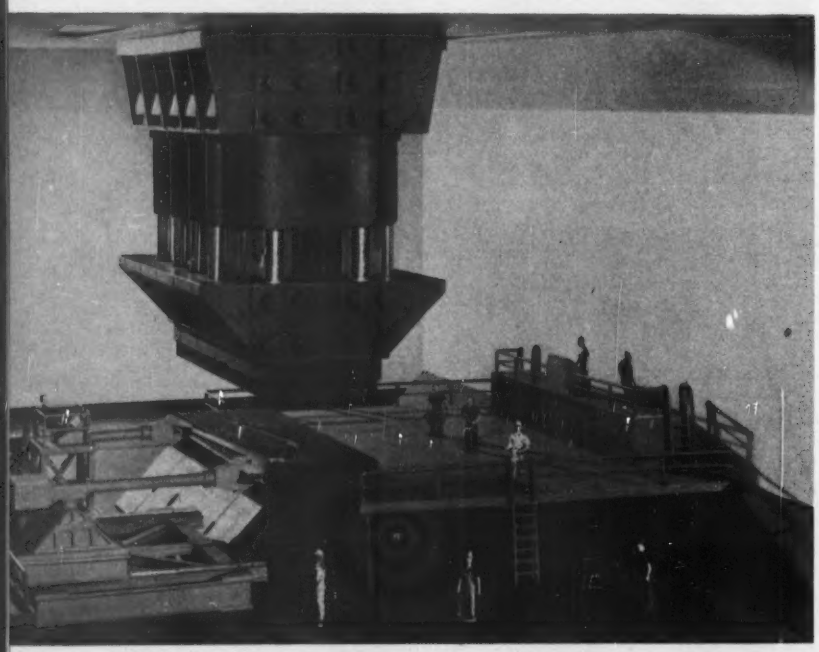
Unique Design Makes Possible 75,000-Ton Throatless Press

A NEW design concept which will bring huge throatless presses with capacities of 75,000 tons or more within the reach of existing machine tools and construction equipment, instead of requiring special facilities for their production, has been announced by the Throatless Press Co., Cleveland, Ohio. The Austin Co. of Cleveland and the Hydraulic Press Mfg. Co. of Mt. Gilead, Ohio, are co-owners of the new firm, whose sole purpose is the development, production, and erection of presses which will provide 360-degree access for placing and removing dies and work of any size required in closed-die forging, rubber pad forming, and die quenching operations.

A three-dimensional scale model of the press (shown in the accompanying illustration) and the massive monolithic concrete structure which would serve the three-fold purpose of supporting, suspending, and completely housing all of the required press elements and operations has been built to explain the design concept. The concrete mass provides the counter-force required to resist the tremendous, concentrated upward pressure developed in forming the largest members used in heavy jet bombers and transport planes. Thus the giant columns and head and base frame castings used for this purpose in conventional presses are not necessary. The throatless press concept originated with C. A. Van Dusen, managing partner of the Van Dusen Engineering Co., Escondido, Calif.

While the actual dimensions of the concrete mass planned around the 75,000-ton forging press have not been announced, the model indicates a structure with an approximate over-all height of 180 feet, 30 feet of which would be below the ground-level "press room." The frame walls would be set 80 feet apart and there would be a clear height of at least 50 feet below the concrete mass which they support and which would form the enclosure for the operating portions of the press. A length of 120 feet is indicated; however, because of the unitized design, this could be increased. Also, the dimensions of the bed could be extended, press sections could be added to increase the tonnage or the pressing-area capacity, or a line of smaller presses could be installed within a single frame.

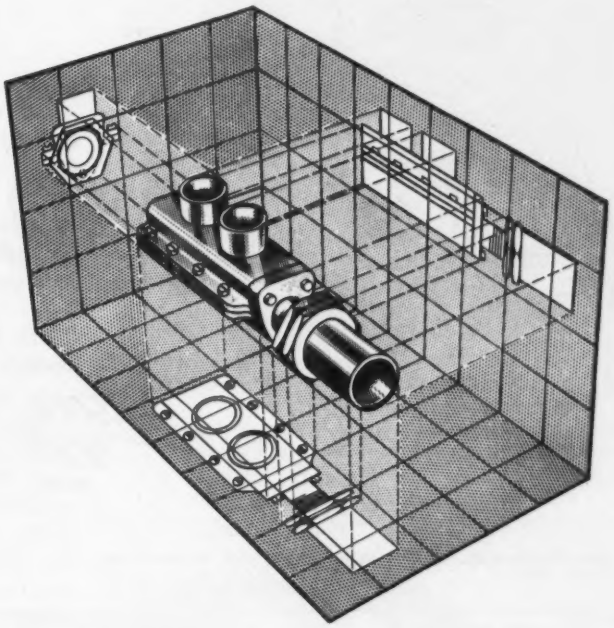
All of the press components would be supported on the structure, so as to utilize their weight as part of the over-all counter-force and to hold the length of pressure piping to a minimum in the interest of operating efficiency and economy. Twelve high-pressure vessels, weighing 90 tons each, would be mounted high on the exterior walls and would serve as the accumulators in which the hydraulic pressures would be built up to operate the press. A 100-ton capacity, gantry type crane would be erected on the roof for use in raising the pressure vessels and in handling huge pumps and compressors to be installed on the roof for operation of the press. They would have an aggregate capacity of approximately 10,000 H.P.



Model of a 75,000-ton forging press in which the press head is attached directly to the ceiling of a massive monolithic concrete frame. This design provides 360-degree access to the die area. Work manipulator is shown at left.

Graphic Illustrations Supersede Blueprints in Production Lines

By LEONARD W. MITCHELL
Technical Art Consultant
Walter Production Illustrations
Detroit, Mich.



GRAPHIC illustrations comprise a large class of three-dimensional drawings, in which the shape or interrelationship of parts of an object—or the location and nature of an operation—can be directly and immediately visualized. As such, "graphics" reduce the element of human error, which is always possible in ferreting out obscure information from involved conventional blueprints. Assembly drawings, exploded views, phantom views, and cutaway views are popular forms of graphics.

Schooling in both engineering and art is required of the graphic illustrator. He must be capable of "translating" the most complex mechanical assembly into a scaled three-dimensional view that instantly clarifies for the worker the structure and relative size and position of all parts. Techniques in preparing graphics may vary from elaborate airbrush treatment to simple penciled isometric or perspective drawings which omit many of the important and minute details of the component or assembly. Exactly how each drawing is to be handled and how much detail it is to contain are in each instance determined by its end use.

It was during World War II that graphic illustrations—also referred to as "production," "technical," or "engineering" illustrations—first made an appearance on the production line. Faced with the gargantuan task of assimilating thousands of new employes virtually overnight, the aviation industry was quick to resort to graphics. They helped immeasurably in orienting workers in the intricacies of setting up and operating unfamiliar machine tools and assembling component parts in their proper order. Adaptation was rapid and information was retained longer, because workers were able to *see* their job.

New methods and materials developed in the last few years are facilitating the production of graphics. Special grids, templates, and mechanical devices for drawing isometric and perspective views are now available. The heading illustration, for example, shows a rather severely foreshortened view which gives a better conception of a part than could be obtained from a blueprint. New photographic and photostatic methods and materials likewise are speeding up the reproduction of drawings, and making it economically feasible to obtain them in various desired sizes.

How a typical machining operation is made realistic by graphics is shown in Fig. 1. In this turret lathe set-up, cutting tools, tool-holders, and turret stations are clearly identified. Inserts of the machining operations are arranged in proper sequence around the corresponding tur-

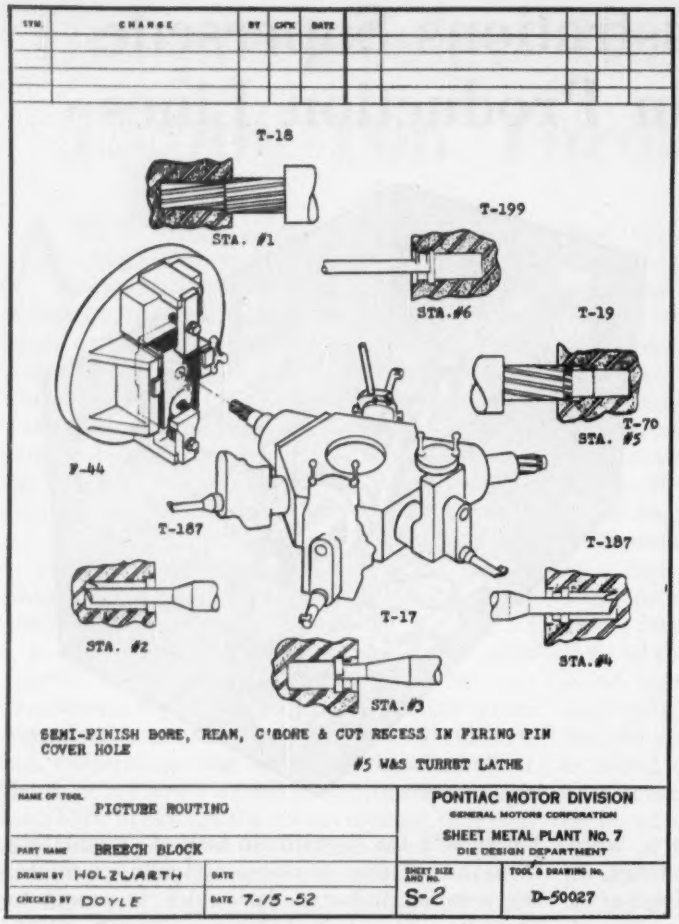


Fig. 1. This turret lathe set-up shows the part being machined held in the fixture, the sequential tooling of the hexagon turret, and the appearance of the part after each operation.

ret faces. By appropriate shading, the area to be machined is readily identifiable in each insert.

The use of graphic illustrations on a combined gaging and assembly line is shown in Fig. 2. Where similar parts or tools may be easily mistaken for one another, an enlarged view of these can be made for quick recognition. Dimensions and instructions pertaining to the particular operation can be added to the graphic. Some shops make a practice of using blueprints in conjunction with graphics, in which instances the dimensions and instructions are taken directly from the blueprints.

* * *

Control of Jet-Engine Fuel

Highly sensitive thermo-couples, manufactured by the General Electric Co.'s Meter and Instrument Department, have made the control of aircraft jet engines easier. Mounted in the tail cones of J47-GE-17 jet engines, the thermo-couples transmit temperature changes to an electronic control that automatically regulates fuel flow to provide optimum performance of the jet engine under all flight conditions.

Sustained accurate measurement of the jet-engine exhaust-gas temperature previously had been prevented by mechanical difficulties caused by the terrific buffeting of the gases, which often approached the speed of sound. This problem was overcome by General Electric engineers after five years of research and testing. The new thermocouple responds rapidly to temperature changes ranging from 1000 to 1900 degrees F., is highly accurate, and retains its characteristics in spite of severe operating conditions.

Fig. 2. Graphic illustrations are employed along this gaging and assembly line in a refrigerator parts plant.

Simple Method of Shaving Gear Segments

DESPITE the impression sometimes prevalent among gear men that it is not practicable to shave gear segments, this operation can be performed satisfactorily with proper equipment. For example, large gear segments are being shaved within close dimensional tolerances by employing the specially designed equipment here illustrated.

The operation is performed on a "Red Ring" gear-shaving machine supplied with a fixture that provides for accurately locating three gear segments at a time on their true pitch diameter around a center post of triangular outline. Short "carry-over" segments are permanently fastened to the fixture between the work locations so as to establish a complete pitch circle. With this arrangement, the three gear segments are shaved simultaneously in a simple routine operation. Loading and unloading are facilitated by jogging the machine table to the front of the machine.

These gear segments have an operating pitch diameter of 36 inches and a face width of 2 1/4 inches. Each segment comprises an arc of 103 degrees, while each carry-over segment on the fixture has an arc of 17 degrees. The carry-over segments may be seen between the work segments in Fig. 3.

Fig. 1. Mounting a gear segment on the table of a "Red Ring" gear-shaving machine which has a unique fixture for handling work of this type.

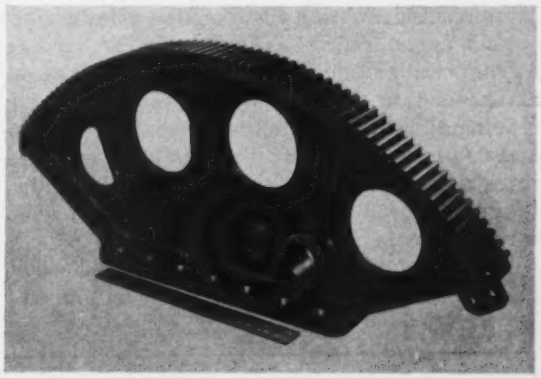


Fig. 2. (Above) The gear segments handled with this equipment have an operating pitch diameter of 36 inches and a face width of 2 1/4 inches. The gear teeth are included in an arc of 103 degrees.

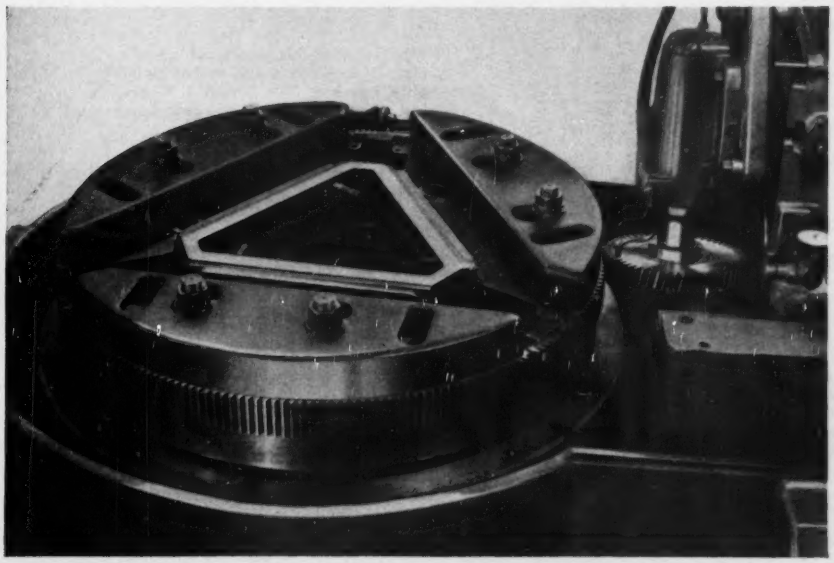


Fig. 3. (Left) Gear shaving becomes a routine operation through the provision of short "carry-over" gear segments permanently attached to the fixture between the work-pieces.

Checking the Accuracy of a Vertical Profiler

By H. A. ROY, Sr.

ACCURATE parts duplication on a vertical profiler requires that the machine pass a rigid inspection. The following procedure is suggested, either for the periodic inspection of a machine in service or for the inspection of a rebuilt machine that is to be put in operation.

As a first step, the amount of spindle run-out should be determined. This can be done, as shown in Fig. 1, by supporting a dial indicator on the table of the profiler, and, with the contact point of the indicator bearing on the internal taper of the spindle, slowly rotating the spindle. The allowable run-out is 0.0005 inch, total indicator reading. With a test bar, the spindle run-out can be determined as in Fig. 2. The bar has a cylindrical section 5 inches long, and is tapered at one end to fit the spindle. Total indicator reading allowances at points *A* and *B* are 0.0005 and 0.001 inch, respectively. For both of these tests, as well as for other tests of the spindle, the spindle-head binder should be tightened when a reading is being taken.

Next, the axial alignment of the spindle hole and the former-pin block is checked. The test bar shown in Fig. 2 can be left in the spindle, and a second bar having the same diameter can be set up in the former-pin block. This arrangement is shown in Fig. 3. With the indicator supported on the table, and with its contact point bearing on the spindle test bar at *A*, the amount of run-out is determined by rotating the spindle, which is stopped at one-half the total indicator reading.

After the indicator is adjusted to the zero mark, the spindle head is traversed on its cross-slide until the contact point bears at *B* on the former-pin block bar. The indication at *B* should not exceed ± 0.002 inch. The spindle head is then returned to its initial position on the cross-slide, and lowered until the contact point bears at *C*. Once again, the indicator is adjusted to the zero mark and the spindle head is traversed until the contact point bears at *D*. The indication at *D* should not exceed ± 0.002 inch.

It is also necessary to check the axial alignment of the spindle hole with the former-pin block in a second vertical plane, at right angles to that shown in Fig. 3. Thus, in Fig. 4 the contact point of the indicator bears at *A'*, *B'*, *C'*,

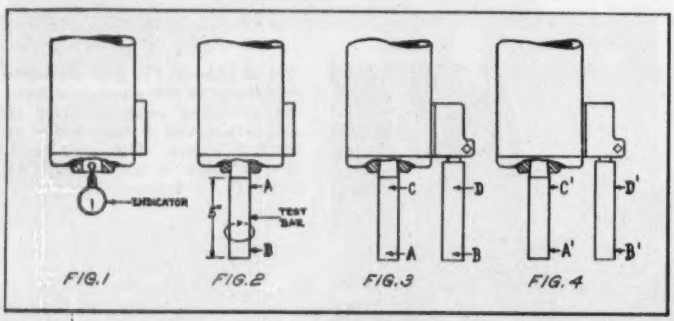


Fig. 1. Run-out check of spindle. Fig. 2. Run-out check at two points on a test bar. Figs. 3 and 4. Checking alignment of former-pin block with spindle hole.

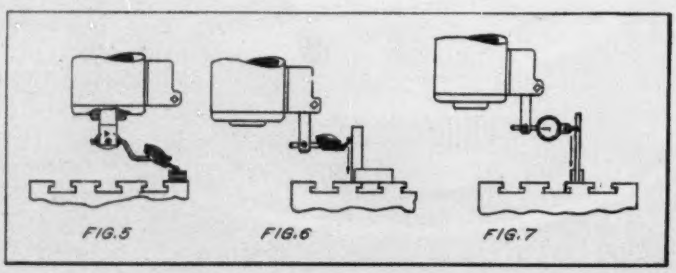


Fig. 5. Any wobble of the spindle caused by looseness in the bearings will show up in this test. Figs. 6 and 7. Checking squareness of the vertical head ways with table.

and D', which are 90 degrees, respectively, to A, B, C, and D, Fig. 3. With the contact point at A' and the indicator adjusted to zero, the spindle head is lowered until the contact point of the indicator is at C'. A tolerance of $\pm$ 0.001 inch is allowed. The spindle head is then raised and traversed until the contact point is at B'. An indication is then made of D'. In this instance a tolerance of $\pm$ 0.002 is allowed.

To check the squareness of the spindle hole with the table, a plug adapter that will receive the shank of a dial indicator is fitted to the spindle. Then, a gage-block is placed on the table, as shown in Fig. 5, and the indicator is adjusted to the zero mark after its contact point has been brought to bear on the surface of the gage. The block is then moved around the spindle in three other positions on the table, all of which are 90 degrees apart. Each position is indicated in turn. A total indicator reading of 0.002 inch is allowed.

The vertical ways of the spindle head should be checked for squareness with the table. For this test, a try-square is first placed across the table, as seen in Fig. 6, and then along the table, as in Fig. 7. In each instance, a reading is taken near the upper end of the blade, after which the head is lowered about 4 inches, and another reading is taken. A tolerance of 0.0012 inch is allowed.

To check the squareness of the cross-slide ways with the table ways, a try-square is laid on the table, as in Fig. 8. By suspending a dial indicator from the former-pin block, the beam of the indicator can be aligned parallel to the table ways. This is done by moving the table until a zero-zero indication is obtained from E to F. Without disturbing the setting of the try-square, the contact point of the indicator is brought to bear at G, the indicator is adjusted to zero, and the head is traversed to bring the contact point to bear at H. The tolerance is 0.0012 inch.

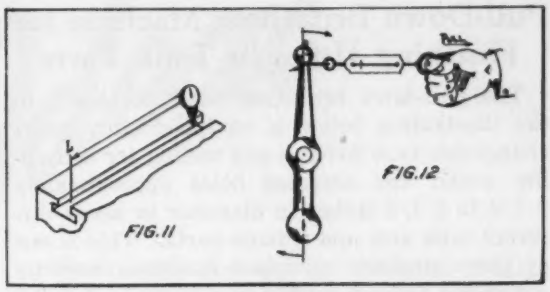


Fig. 11. Checking the parallelism of the stems of the table T-slots. Fig. 12. The pressure required to move the cross-slide or the table is determined with the aid of a small weight scale.

While the indicator is suspended from the former-pin block, a check can be made of the parallelism of the cross-slide with the table. A transverse check is illustrated in Fig. 9, the cross-slide being moved from the position shown to where the indicator contact point bears at J. A longitudinal check is performed by moving the table from the position illustrated in Fig. 10 to where the indicator contact point bears at K. The tolerance allowed in each of these checks is 0.0012 inch.

The parallelism of the stems of the table T-slots should also be checked while the indicator is suspended from the former-pin block. For this test, the table is moved from the position illustrated in Fig. 11 to where the indicator contact point bears at L. A tolerance of 0.001 inch is allowed. A check of the tightness of the cross-slide and table gibs can be made with the aid of a small weight scale, as shown in Fig. 12. From 5 to 6 pounds of pressure, evenly exerted, should be required to move either the cross-slide or the table.

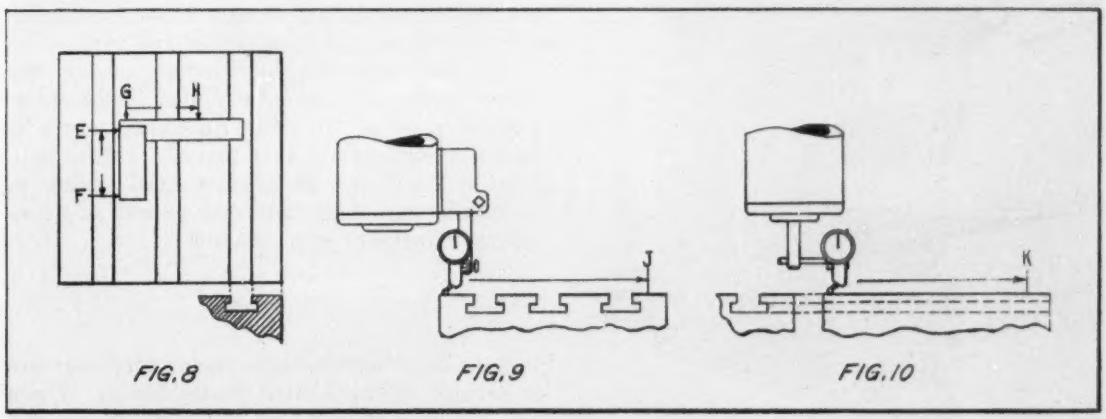


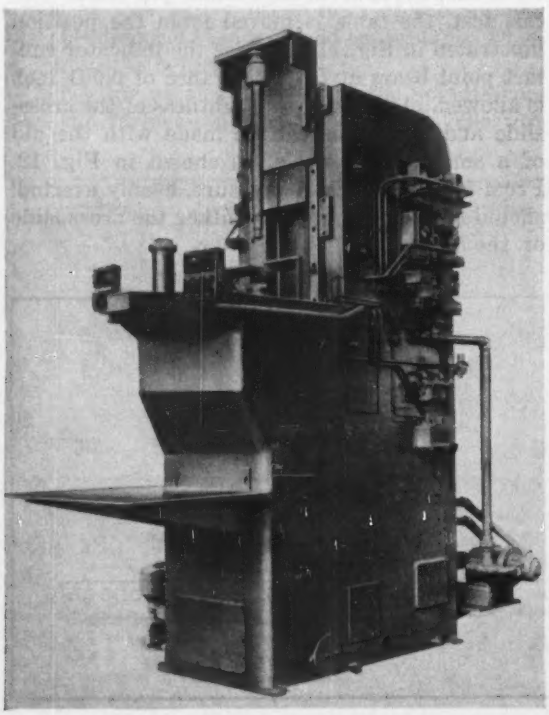
Fig. 8. Squareness of the cross-slide ways with the table ways is checked as here illustrated.
Figs. 9 and 10. Testing the parallelism of the cross-slide ways with the table ways.

Pull-Down Broaching Machine for Finishing Holes in Tank Parts

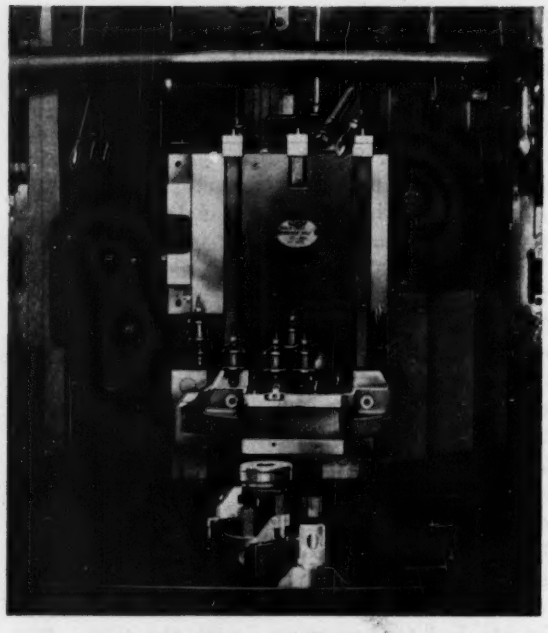
The pull-down broaching machine shown in the illustration below is equipped with interchangeable base fixtures and tooling for broaching round and serrated holes approximately 3 1/4 to 3 1/2 inches in diameter in seven different tank arm and spindle parts. This is one of three similarly equipped machines recently completed for a manufacturer of tank parts by the American Broach & Machine Co., Ann Arbor, Mich.

Inherent stability has been built into this equipment by having the machine slide and the retriever slide move on the same ways. The retriever guides the upper end of the broach down through the major portion of the cutting stroke. With the broach held securely at both ends during most of the cutting stroke, misalignment and vibration are minimized.

An electrical interlock between the broach retriever and work stroke mechanisms automatically stops the cycle if by chance the pull-head should fail to connect with the broach. The hydraulic receding work-slide, which is also interlocked to the machine cycle, facilitates loading and increases production. This machine will handle parts that are too heavy or awkward to broach on a regular pull-up broaching machine.



Broaching machine with interchangeable fixtures for finishing round and serrated holes in seven different parts



Salvo thread-rolling attachment applied to Mult-Au-Matic for production of large-diameter threads on rocket parts

Rolling Threads on Rocket Parts without Changing Cycle

Through the use of a special thread-rolling attachment, the large-diameter threads on a rocket part machined on a Bullard Mult-Au-Matic are now being produced without requiring additional time or change in the normal operating cycle of the machine. This eliminates the necessity for re-chucking or transferring the part to another machine for the threading operation, and also assures accurate alignment of the thread with other machined surfaces. The attachment, built by the Salvo Tool & Engineering Co., Roseville, Mich., has solved the troublesome problem of producing threads that are concentric with faces and shoulders of the part.

The accompanying illustration shows the thread-rolling attachment mounted on the cross-turning slide of the Mult-Au-Matic, where it rolls the required 4 3/4–12 thread. This attachment is credited with a substantial saving in machining and inspection costs, as well as a considerable increase in production.

* * *

More than 50,000 single-engine airplanes are in service in the United States today. There are also 2700 twin-engine, 540 four-engine, and 12 tri-motored aircraft, according to the Civil Aeronautics Commission.

TOOL ENGINEERING *Ideas*

Tools and Fixtures of Unusual Design and Time- and Labor-Saving Methods that Have been Found Useful by Men Engaged in Tool Design and Shop Work

Double-Coil Winding Fixture

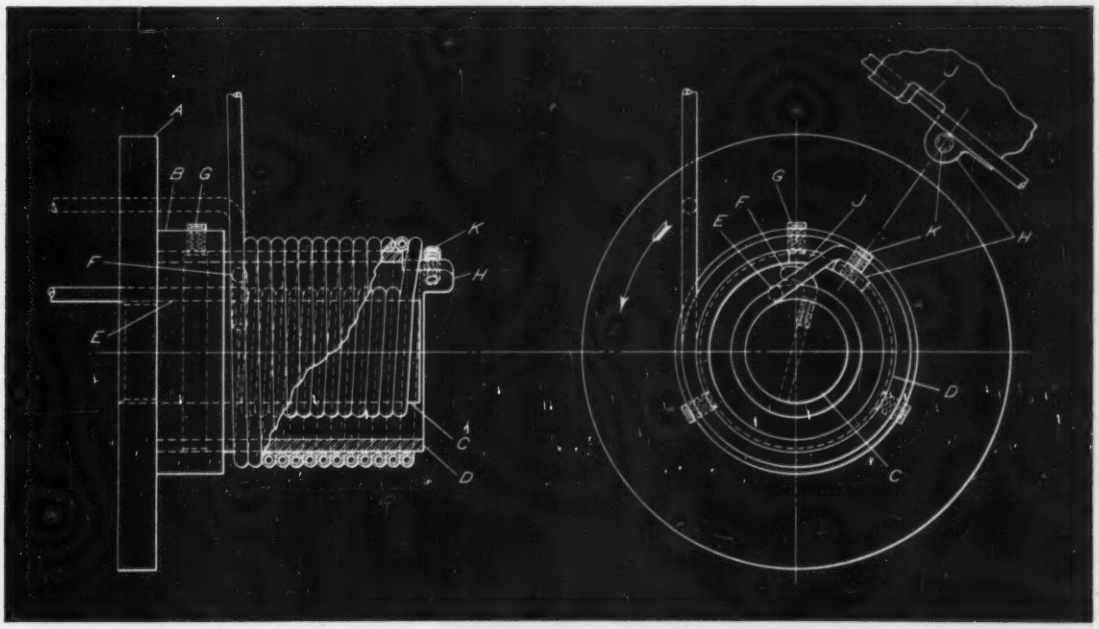
By ERNEST C. McMEIN, Elmhurst, N. Y.

In a recent design of an insecticidal fog application machine, maximum efficiency required that the liquid be directed through a cooling coil of copper tubing on the suction side of the pump. Limited space precluded the use of a single coil of sufficient length, so the tubing was wound in a continuous double coil—an inner coil and an outer coil. A lathe was adapted with the fixture shown in the illustration for producing the coil.

This fixture consists of a cast-iron faceplate *A*, having an integral cored hub *B*, a bar *C*, and a sleeve *D*. The bar, which is the same diameter as the required inside diameter of the inner coil, is permanently fixed to the faceplate; and the sleeve, having the same outside diameter as the inside diameter of the outer coil, fits on the machined core of the faceplate hub, and is removable.

Winding of the inner coil is completed first, one end of the tubing being held in a hole *E* drilled in the faceplate. As the lathe spindle rotates slowly, a hook *F* projecting from a point on the bar near the hub catches the tubing. A suitable supporting member in the toolpost guides the tubing onto the bar as the carriage moves to the right. This movement is controlled by the lead-screw of the lathe, which has been geared for 5 1/2 threads per inch, thus producing a lead of 0.181 inch. Since this lead corresponds quite closely to the outside diameter of the tubing—0.187 inch—a tightly wound coil is assured.

When the tubing has been completely wound to the right-hand end of the bar, the lathe is



Fixture mounted on a lathe for winding a continuous double coil of copper tubing

momentarily stopped, and sleeve *D* is slipped over the still unwound length of tubing and into position over the inner coil. Set-screws *G* secure the sleeve to the hub. The operator then directs the tubing over the lip *H* on the end of the sleeve and the tubing winds around the outside diameter of the sleeve as the lathe spindle rotates and the carriage moves to the left. The enlarged view of the lip shows how the tubing runs out through a slot *J* and back against a threaded end-stop *K*.

After the outer coil has been completed, the lathe is stopped, the set-screws *G* are loosened, and the coils and sleeve are removed as a unit. The coils can then be slipped off the faceplate end of the sleeve. Since the lathe spindle rotates in the same direction for winding both coils, the inner coil has a left-hand helix and the outer coil, a right-hand helix.

Centering and Side-Clamping Collet

By MORDECHAI MONTAG, Boston, Mass.

The collet shown in Fig. 1 was designed to locate the work-piece *E*, first against a shoulder on sleeve *D* and then by the slotted expanding collet sleeve *G* in order to clamp it in a central position. This collet can be used when a hole or a number of holes have to be drilled accurately at a distance *a*, for example, from one side of a ring, and also when they must be accurately positioned on a radial line or at a specified off-center distance.

Positioning of a groove at a precise distance *b* from the base or face of work-piece *E* and turning it concentric with the inside diameter can also be easily accomplished when using this collet for turning operations.

The collet provides two clamping actions through one movement of the draw-rod *A*. A number of fingers *N* press the work-piece *E* down, and the collet sleeve *G* grips it centrally. To enable quick unloading of the finished parts, the fingers *N* must retract into cap *K*.

Half-section views *A*, *B*, and *C*, Fig. 2, show the collet in the open, partly closed, and nearly closed positions, respectively, the completely closed position being shown in Fig. 1. In the open position, view *A*, Fig. 2, the upper spring *L*, Fig. 1, and the lower spring *F* are relieved, this allows the center spring *I* to expand and move the fingers *N* to the retracted position shown. In this position, the work-piece *E* can be slid off or on over the cap *K*. During the opening or upward movement of rod *A*, pins *H* pull the collet sleeve *G* upward and thus relieve the centralizing clamping pressure exerted on the work.

In the partly closed position shown at *B*, Fig. 2, the cap *K* moves down distance *c*, which causes pressure on all three springs, *F*, *I*, and *L*. The deflection of the springs *F* and *L* is very small, while spring *I* is compressed sufficiently to cause the fingers *N* to swing outward.

Further closing of the cap *K* to a distance *d*, indicated in view *C*, Fig. 2, causes the fingers *N* to clamp the work-piece *E* against the shoulder on collar *D*. The fingers *N* stay in the same position as that shown in view *B* because they rest against the upper part of sleeve *J*. This also causes the sleeve *J* and the fingers *N* to move as one unit.

When the cap is further closed, the spring *L* is compressed and more pressure is applied through the fingers *N* to the work-piece *E*,

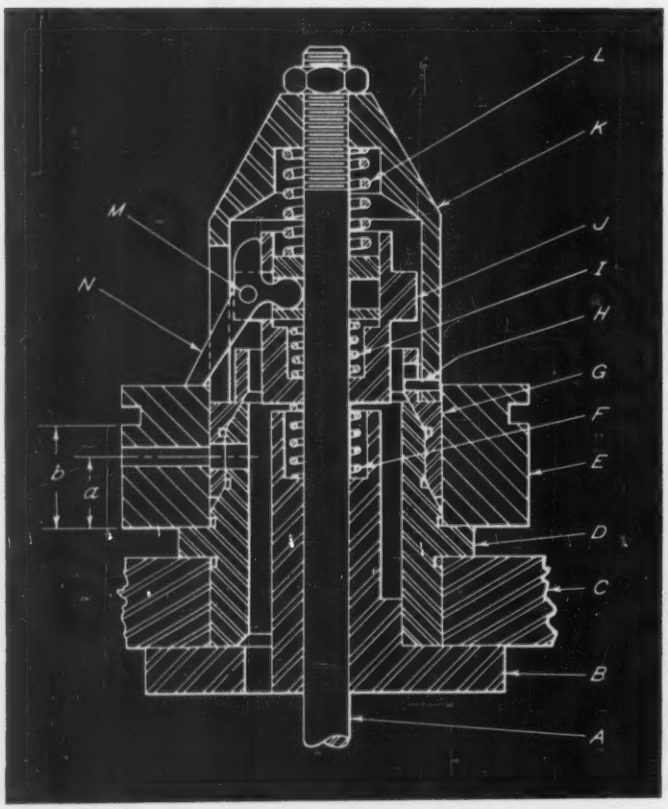
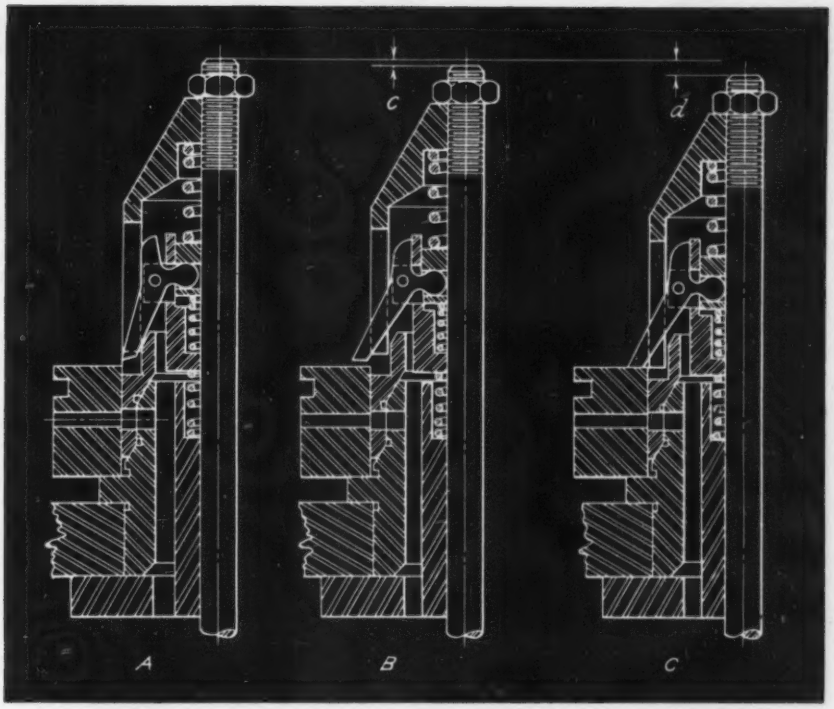


Fig. 1. Collet designed to permit work (E) to be clamped in a centralized position by means of draw-rod (A). This view shows collet in fully closed position.

Fig. 2. (A) Half-section view of collet in open position. (B) Collet in partly closed position with hold-down fingers expanded. (C) Collet in the nearly closed position with clamping fingers (N), Fig. 1, in contact with work (E).



until the bottom of the cap *K* presses on the shoulder of the collet sleeve *G*, as shown in Fig. 1.

This collet can be mounted in any desired position through plate *C*. Ample space is provided for chips between members *B* and *D*. When the collet is used in a vertical position and a side drilling operation is performed, the chips will fall down through openings in the collar of member *B*. The collet members must be so assembled that there will be no rotary movement between members *G* and *D*, in order to keep the clearance hole on the collet sleeve *G* in the correct position for drilling.

Drill Jig with Novel Indexing Feature

By ROBERT MAWSON

Accurate indexing to permit drilling and tapping three angular holes in the part seen at *X* in the illustration (see following page) is obtained by means of a novel feature on the drill jig here described. The three holes, 5/16 inch in diameter, must be drilled at an angle of 9 degrees and 20 minutes with the previously faced flange of the part, parallel with three other angular holes, and accurately located with respect to two holes reamed perpendicular to the flange face.

Pressed into the angular face of the positioning block *A* on which the work-piece rests are two shouldered locating pins *B* and three dowels *C* that enter the previously machined holes in the work-piece. The dowels must be a loose fit in the holes, and serve only as a guide in locating the part in the jig. Secured to the angular face of the positioning block are two work-supporting plates *R*. These plates are slotted to clear dowels *C*. A trunnion shaft *D*, screwed and doweled to the under side of positioning block *A*, can be rotated in a bronze bushing *E* which is pressed into the welded base *F* of the jig. On the lower, threaded end of the shaft are mounted a collar and two nuts.

On top of the jig base and overhanging the work is a hinged bushing plate *G*, which can be pivoted about a pin *H* supported in the base. A latch, consisting of a stationary member *J* that is secured to the jig base and a movable member *K* pinned to operating handle *L*, is provided for locking the bushing plate in the drilling position shown. Spring-loaded pin *M* holds the latch in engagement until the handle is rotated.

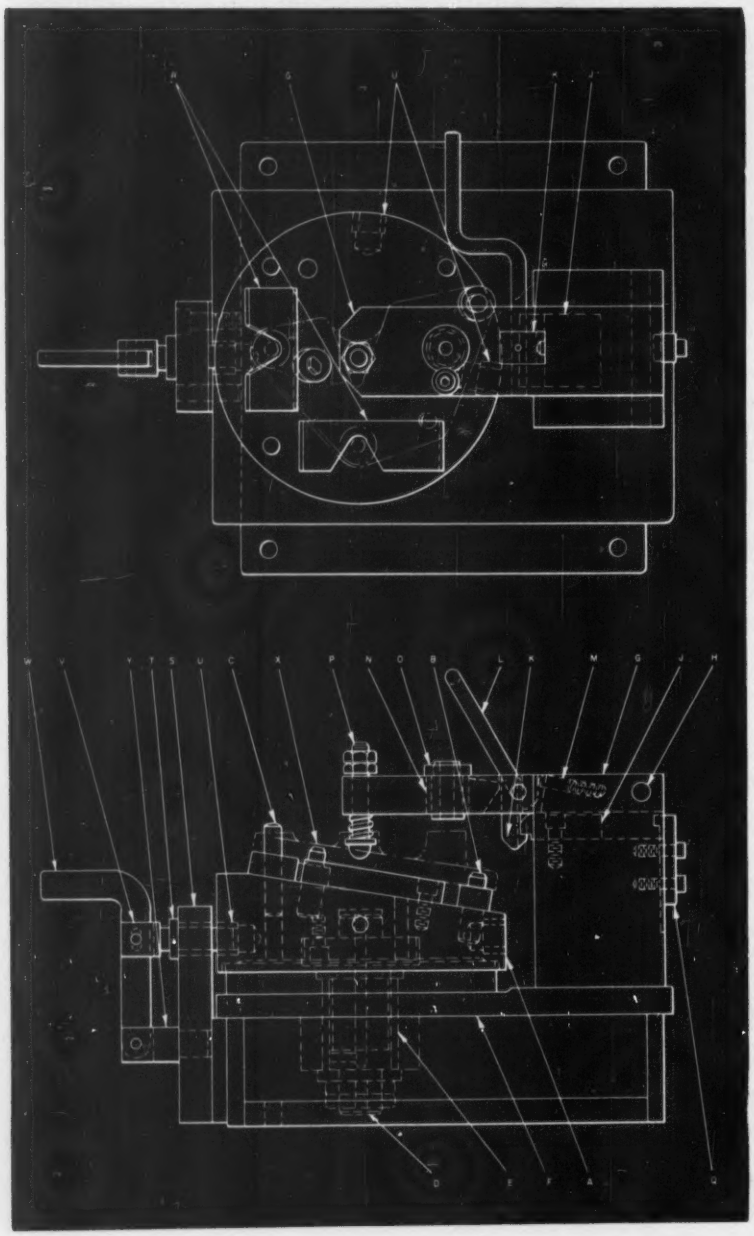
Accurately located in hinged plate *G* is the liner tap bushing *N* and the slip drill bushing *O*. A spring-loaded work-holding pin *P* is mounted in the outer end of the bushing plate, in alignment with the trunnion shaft *D*. Mounted in a slot in the right-hand face of the jig base is an adjustable tool-setting gage *Q*.

The indexing arrangement, located on the left-hand face of the jig base, contains a plate *S* that is secured to the base by screws and dowels.

Slidably mounted in a bushing *T* pressed into this plate, and entering one of the three bushings *U* pressed into positioning block *A*, is an indexing plunger *V*. The outer slotted end of this plunger is pinned to lever *W*, which can be pivoted about a pin mounted in a shouldered plug *Y*. This plug is a press fit in plate *S*.

In operation, the jig is secured to the table of a drill press by placing screws through the four holes in the jig base. Handle *L* is then swung clockwise to release latch *K*, and the hinged bushing plate *G* is pivoted to the open position. One of the work-pieces to be machined is placed in the fixture, sliding on the loose-fitting dowels *C* and being accurately located on pins *B*. The bushing plate is then returned to the closed or drilling position shown, and handle *L* is swung counter-clockwise to engage the latch. This movement brings the ball-end of pin *P* into contact with the work to securely hold it in place.

Positioning block *A* is rotated by hand until plunger *V* enters one of the three bushings *U* in the block. After drilling a 5/16-inch diameter hole in the work-piece, the plunger is withdrawn by depressing lever *W*. Block *A* is again rotated until the plunger enters the next bushing, and the second hole is drilled. After drilling the third hole and removing the slip drill bushing *O*, the cycle is repeated to thread the three holes with a 3/8–16 tap.



Drill jig employed for accurate indexing of work-piece (X) to permit drilling and tapping three angular holes in the part. Indexing is accomplished by rotating positioning block (A) until plunger (V) enters one of the three bushings (U) in the block. The jig is equipped with a hinged bushing plate (G)

* * *

Lightweight Power House for Starting Jet Engines

Weighing less than 150 pounds, one of the world's smallest gas turbines delivers 84 H.P. Used as the source to provide self-starting power for jet aircraft engines, it operates a pneumatic system on the same plane as well.

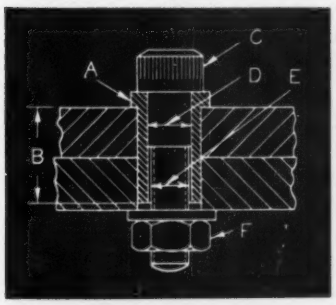
In order to produce this power from such a small unit, its rotor must turn at a speed of 40,000 R.P.M., and withstand temperatures up to 1600 degrees F. For these reasons, Inconel "X" —a nickel - chromium - iron alloy which retains its strength at elevated temperatures—was selected for the components of the gas-turbine rotor.

Ideas for Shop and Drafting-Room

Bolt Bushing Serves as Dowel-Pin

By HOLGER BRÖNNUM, Copenhagen, Denmark

Two units bolted together which must be returned to their initial alignment after subsequent disassembly ordinarily include dowel-pins in their design. If the application is such that disassemblies are to be frequent, the dowel-pin feature can be conveniently combined with the bolt.



Pilot diameter (D) of bolt (C) serves as a dowel-pin.

Both of the units are line-reamed to receive a bushing *A*. The distance *B*, from the shoulder to end of the bushing, is made slightly shorter than the thickness of the units. A bolt *C* has a pilot diameter *D* bearing on the inside of the bushing, and a threaded diameter *E* engaging a nut *F*.

Indicator for Centering Punch Mark

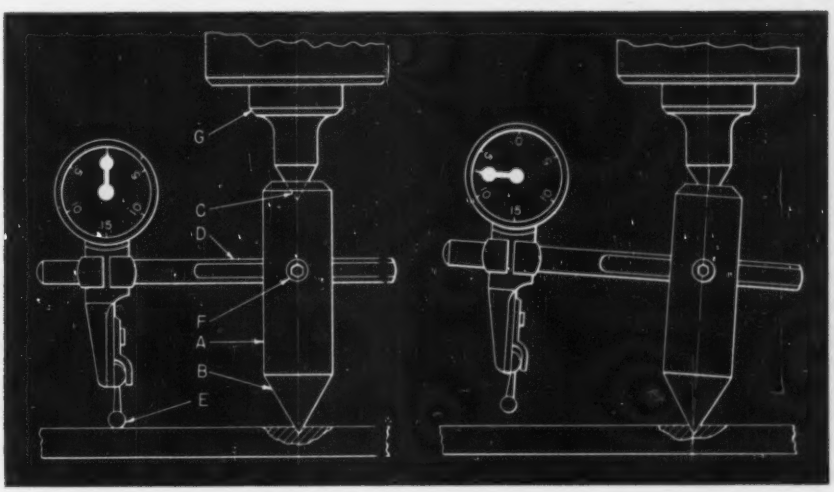
By JOSE SOBKOWIAK, Jackson, Mich.

A simple centering plug enables a dial indicator to be used to center the punch mark of a lay-out under the spindle of a drill press. This plug, shown at *A* in the illustration, has a conical lower end *B* and a countersunk center *C* in its upper end. The arm *D* of the indicator is contained in a hole drilled across the plug axis at a point that allows the nib *E* to make contact with the work surface when the conical end *B* is on the punch mark. A set-screw *F* holds the arm fast in the plug.

To use the attachment, the spindle socket is first provided with a shank *G* that has been turned down to a 60-degree point. The work is placed on the drill press table with the punch mark approximately centered by eye under the spindle, the plug is placed on the punch mark, and the quill of the drill press is lowered until the point of the shank *G* makes a light but firm contact in the countersunk center *C*. Shank *G* can be ground from a broken or discarded drill.

With the indicator adjusted to the zero mark, the plug is rotated by hand through 360 degrees. If the indicator maintains its zero reading throughout the rotation, the punch mark is correctly aligned. This is shown by the alignment of the center lines of the spindle, plug, and punch mark in the left-hand view. The work can then be secured to the table.

However, if during the rotation of the plug the indicator reading changes, the punch mark is not correctly aligned, and the center lines of the spindle, plug, and punch mark will not coincide. To illustrate this condition, the misalignment is exaggerated somewhat in the right-hand view. It is then necessary to reset the work under the spindle, until by trial and error the indicator maintains its zero reading throughout the rotation of the plug.



Rotating the plug (A) with a dial indicator attached as here shown tests the alignment of the punch mark under the spindle.

Gear and Clutch Mechanism for Variable Operating Conditions

By W. M. HALLIDAY

THE various slides of multiple-slide wire-bending machines must be operated at different lengths of stroke, speeds of travel, and dwell periods at points of reversal because of differences in the thickness, springiness, and shape of the material. An interesting gear and clutch transmission designed to actuate a former-slide in the various required movements is described in this article.

The principal operating features embodied in the mechanism are shown in Fig. 1. A short connecting-rod *A* has one end affixed to an eccentric disc (not shown) which is attached to a continuously revolving shaft carried in the machine frame. The other end is attached to lever *B* by means of pin *C*. Lever *B* is fastened to shaft *D* by key *E*, the shaft being mounted in bearings integral with the machine frame. Also keyed to shaft *D* and located in back of lever *B*, is a spur gear *F*.

Gear *F* meshes with gear *G*, which is mounted to rotate freely on stationary shaft *H*, which in turn is rigidly attached to the machine frame. Both gears are of the same size and are located on a common horizontal center line. Swinging freely on a slightly reduced shouldered portion of shaft *H* is a lever *I*. One end of this lever is linked to the connecting-rod *J* by means of pin *K*, and the opposite end is linked directly to the former-slide.

The lower end of lever *I* has a large boss *W*, in the center of which is a tapered hole. Fitting smoothly in this hole is a circular cone clutch ring *L*, which is keyed to the stationary shaft *H* by key *M*. Shaft *H* projects beyond the clutch ring, the extension being externally threaded for lock-nuts *N*. By adjusting the setting of these nuts, variable pressures can be imposed on the clutch ring in its engagement in the tapered recess of lever *I*. With this arrangement a certain degree of frictional restraint can be imparted to the swinging movements of lever *I* and connecting-rod *J*, as well as all other driven members connected to them, at each point of movement reversal.

Lever *I* and gear *G* are connected by two stop-dogs *R* which bear on the sides of lever *I*. The face of the gear has a circular T-slot *O* located concentrically to the bore. Two T-bolts *P* are placed in this slot through the rectangular opening *Q*. Two hardened steel stop-dogs *R*, provided with tongues to suit slot *O*, are radially adjustable to desired positions. They may be locked to the face of the gear by screwing nuts *S* on T-bolts *P*.

Each stop-dog has a tapered contact nose *T* for bearing against a flat lug *U* on each side of lever *I*. If the dogs are adjusted to bear directly against lugs *U*, there are no dwell periods. On the other hand, by setting one of the dogs back from its corresponding lug *U* to leave a gap, as indicated, the drive between gear *G* and lever *I* will be interrupted, and there will be a short period of inaction, or dwell, of the lever and the former-slide. By applying sufficient pressure on the clutch ring, any movement of lever *I* and the former-slide will be arrested when the dwell points are reached, yet the lever will be permitted to slip over the clutch mechanism when a positive driving pressure is again imparted to the lever.

In operation, the relative positions occupied by the respective levers and gears at the beginning of the forward working stroke of connecting-rod *A* are shown by the heavy lines in Fig. 1. Rod *A* and lever *B* have, in fact, moved a slight amount toward the right to bring the stop-dog on the left-hand side of lever *I* into direct contact with bearing lug *U* on the same side of the lever. The positions of the driving and driven levers are indicated at *a* and *c*, respectively, and from this position all movement of rod *A* to the right will be transmitted positively to the connecting-rod *J* with all members moving in exact unison. Connecting-rod *J* and the former-slide attached to it will travel at precisely the same speed as connecting-rod *A*, since gears *F* and *G* have a one-to-one ratio and levers *B* and *I* are the same length.

When rod *A* reaches the extreme right-hand limit of its movement, as shown by the dotted lines at *b*, rod *J* and lever *I* will have reached position *d*. With the return movement of rod *A*, however, the driven members will remain stationary for a certain period, or until the stop-dog *R* on the right-hand side of lever *I* is brought to bear against lug *U* on that side of the lever. When this contact takes place, the lever will be

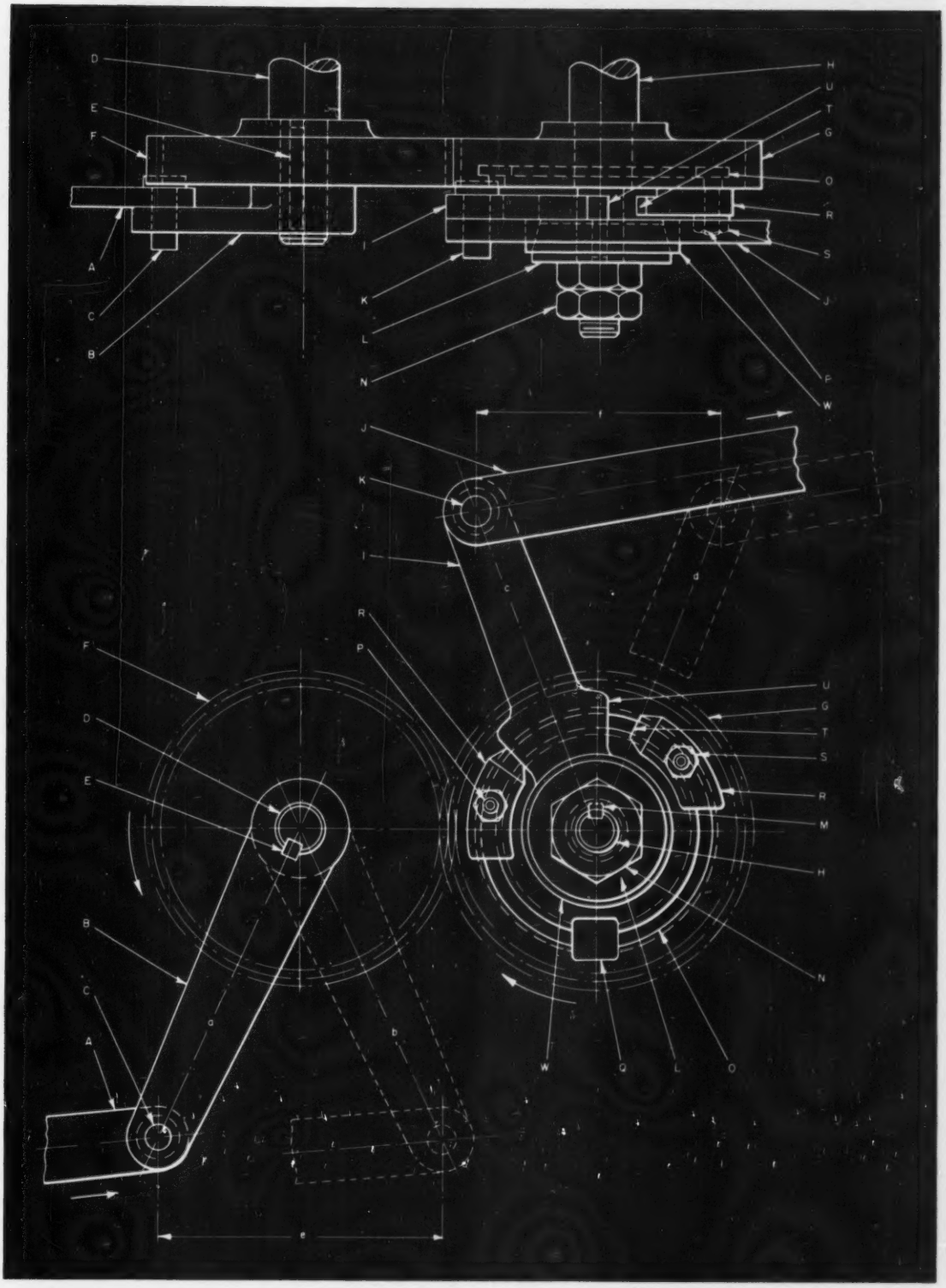


Fig. 1. Gear and clutch mechanism which produces a reciprocating motion with dwell periods. The driving and driven members are connecting-rods (A) and (J), respectively.

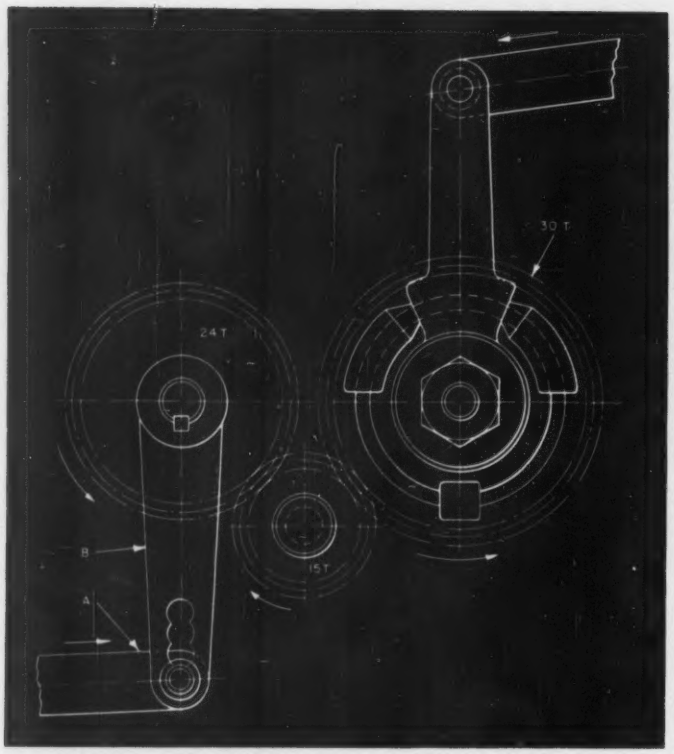


Fig. 2. Modification of mechanism shown in Fig. 1, which provides reversal of stroke direction and various stroke lengths and dwell periods.

drawn toward the left in unison with the movement of rod *A*. At the termination of this return stroke, when rod *A* and lever *B* have been drawn slightly to the left of the positions indicated at *a*, a second dwell period will occur, which lasts until the left-hand dog *R* bears against the adjacent lug of handle *I*.

The dwell periods may be varied by setting the dogs in different positions on the driven gear. Respective movements of levers *B* and *I* will then be different; the latter will have a shorter length of travel. The different stroke lengths are shown at *e* and *f*.

How the mechanism may be modified to produce a wider range of stroke and dwell adjustments is illustrated in Fig. 2. This is accomplished by using gears of other than a one-to-one ratio, and by providing a series of connected holes in the end of the driving lever *B* to permit varying the radial setting of rod *A*. The fifteen-tooth intermediate gear shown reverses the stroke direction.

* * *

Since the middle of 1950, deliveries of all military planes has increased more than four times (now almost 1000 a month); and deliveries of jet military planes are more than five times the rate of 2 1/2 years ago—nearly four-fifths of the way to presently planned peak rates.

Demonstrating Effectiveness of Safety Glasses

A "pistol" which shoots steel "bullets" is helping to protect the eyesight of employes of the General Electric Co. The gun is part of a unique "eyesaver" unit used to point out the effectiveness of safety glasses to employes of the company's Large Steam Turbine and Generator Department in Schenectady.

Mounted at one end of the "eyesaver" unit, which is about the size and shape of an ordinary shoe box, the gun fires a steel ball at a pair of eyeglass lenses at the other end of the box. The person demonstrating the device shoots the gun at each of the lenses. The steel ball easily shatters one lens, which is made of ordinary glass, but bounces harmlessly off the safety glass used for the other lens.

* * *

Ancient "Nickel" Same as Today's

The composition of certain coins issued over 2000 years ago by the Bactrians, an ancient Asiatic people, is strikingly similar to the present United States five-cent piece. The Bactrian coins, when analyzed, were found to contain 75 per cent copper and 25 per cent nickel, the same proportions as the alloy employed in the United States nickel used today.

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

Plant Creating a Public Nuisance

M. P. T.—Can the city government stop the operation of our manufacturing plant because fumes have recently started to escape into the atmosphere surrounding the plant? Property owners living near the plant claim that a public nuisance has been created and that the fumes are injurious.

Answered by Leo T. Parker, Attorney at Law
Cincinnati, Ohio

Since your nuisance is new, the city officials can make you abate the nuisance or take action to close your plant. For example, in National vs. City [20 So. (2d) 329], a city sued a company to abate a new public nuisance arising from the operation of its establishment The testimony proved that the plant, which was operated in a densely settled residential area, had started to emit fumes injuriously affecting the "health and well-being of the citizens."

The higher court granted an injunction against further operation of the plant, saying: "If the structure is a nuisance, and will necessarily continue to be a nuisance, and is incapable of remedy by alteration, repair, or change of process, which would effectually correct the evil of its presence, it ought not to be allowed in the neighborhood where it has been set up."

Spotting of Cadmium Plate

W. H. C.—After cadmium-plating some brass castings, they looked satisfactory. However, in a few days, they became covered with white spots. What causes this, and what can be done to prevent it?

Answered by Frederic B. Stevens, Inc.
Detroit, Mich.

If the white spots on the cadmium-plated brass castings have small dark centers, the phenomenon is what is commonly called "spotting out." This is caused by pores in the castings which retain plating solution. When the articles are dried, the salts remain in the pores, and, being deliquescent, take moisture from the air and finally ooze out and discolor the surface around the pores. The best solution to this problem is to have the castings pore-free prior to cadmium-plating. However, this is not always practicable. Alternate rinsing in hot and cold water several times will help to rinse out the pores. A chromate type bright-dip surface treatment may also be helpful in preventing spotting out of the plated castings.

Magnetism of Columbium-Stabilized Castings

D. J. R.—Are columbium-stabilized castings ever magnetic?

Answered by the Valve Clinic of the Copper Alloy Foundry Co., Hillside, N. J.

Yes, columbium is a ferrite former and will help to promote magnetism. If the chemical composition balance is such that the alloy is nearly magnetic, a columbium addition may make it positively so.

* * *

Testing Tool Life with Radioactive Cutting Tools

Research scientists of the Cincinnati Milling Machine Co., Cincinnati, Ohio, have conceived the idea of using a radioactive cutting tool to measure tool wear. They developed a technique consisting of machining with tools which had been rendered radioactive by neutron irradiation in a nuclear reactor, collecting the resulting chips, and measuring their radioactivity due to particles abraded from the tool during a few seconds of cutting. They found that this procedure provides a direct measure of tool wear and tool life and, at the same time, results in much better accuracy than that obtainable from conventional tool life testing methods.

* * *

Each new production model of a jet warplane requires some 10,000 engineering drawings plus 25,000 new tools.

THE SALES ENGINEER AND HIS PROBLEMS

By BERNARD LESTER
Lester and Silver
Sales Management Engineers
New York and Philadelphia

Choosing Jobs and Choosing Men

WITHIN the last year, the writer has had occasion to interview many sales engineers in an attempt to evaluate their capabilities and job satisfaction. A surprising number are not contented or satisfied. Job dissatisfaction is tremendously expensive to man and employer in loss of spirit, time, and efficiency. It can exceed all other forms of losses put together.

Let's consider the two problems of choosing the employer and choosing the employe. Succeeding articles will touch on the subjects of what the sales engineer and the sales manager or company can do to improve job relationship.

Many difficulties result from the failure of employes and management to understand that a job is more than just a position—it is a relationship between man and company. To be successful, this relationship must insure harmonious advancement. Choosing an employer and a job approach marriage in seriousness.

Job satisfaction starts with the choice of the right company and the right job, and the choice of the right man for the job. Numberless heartaches occur because such choices are not carefully made. So if we are just starting a career, or contemplate a business change, or hold the position of sales manager choosing men, the question is how to avoid heartaches later on.

The Sales Engineer's Choice

Repeatedly, mature and technically trained men do not carefully evaluate, on the one hand, their interests and abilities, and on the other, the character of the work and the prospective employer. Many wake up later to find that "Marriage is not all it's cracked up to be." One sales engineer recently told me, "I wish I had gone into engineering development and design." Another junior production supervisor said "I've decided I'd make a better sales engineer, but there's no opening now."

Don't discount the importance of broad experience in preparation for a sales engineering job. Many companies plan a variety of successive jobs in order to develop the man. Fewer sales engineers deliberately plan likewise. In too many cases, the man sizes up the company from lopsided information and scattered facts. Seldom does the man fully understand the organization and operations of the company, its financial resources, record of earnings, accomplishments, policies, general future plans, or details of employe relations.

Small equipment suppliers are often the hardest to size up. "We're just one happy family" says the company official; but its not long before the new employe finds himself working for a firm that is riddled with friction, factions, and favoritism.

Many sales engineers do not analyze their own aptitudes so as to choose wisely whether to work for a large company which may offer greater security, or a small one presenting greater risks but more rapid advancement. The commonest failure of all is due to the fact that the man looking for the job does not gather complete facts, evaluate them correctly, reach a decision, and then stick to it.

The Sales Manager's Choice

So many equipment suppliers are experts in choosing materials and machinery wisely, but do not devote equal care in choosing men, which is far more important to success. Sales managers often select a candidate largely by "hunch," and then instinctively try to sell him the job. Considering any one candidate, a careful study should be made to determine his latent abilities

along the following lines: To plan intelligently, to communicate clearly, to calculate (mathematically), to lead and influence others, to delegate activities to others, and to make decisions. Other factors to be considered are, of course, appearance, habits, social attitudes and family relationships.

All material accomplishments hark back to man power. Is there anything in industry more important than choosing capable men? And outside of home life, is there anything that can better lead to happiness than correctly choosing the company or the job?

* * *

Advance in Titanium Production and Application

C. I. Bradford, director of operations of Rem-Cru Titanium, Inc., Midland, Pa., told members of the Society of Automotive Engineers at their recent annual meeting of the following advances that have been made in the production and application of titanium:

1. The industry has jumped from titanium ingots of poundage size to tonnage size. Two-ton ingots are now being made.
2. Up to 5 tons per day of metal are being produced; facilities for 20 tons per day are under construction.
3. Continuous wide strip processing is a reality.
4. Reliable alloys are now available in virtually all the standard forms in which stainless steel is produced.
5. Quality is being brought under control.
6. Production applications are now established in aviation and other industries.

* * *

Fine Wire for Vacuum Tubes

Microscopically fine wire manufactured from pure nickel is employed for the grids of subminiature vacuum tubes such as those used in hearing aids. The wire, which is made of nickel because this material has favorable electrical characteristics, ductility, and strength, is much finer than a human hair.

Ingot Poured for Huge Press Column

Steel was poured at the Bethlehem, Pa., plant of the Bethlehem Steel Co. on January 14 for one of the three members required for each column of the largest forging press in the United States Air Force's heavy press program. The mold for this ingot was approximately 18 feet high by 9 feet in diameter. Eighteen ingots of these dimensions will be required to fabricate the six press columns.

The columns for this press constitute a complete departure from the conventional one-piece cylindrical design. The columns will be of rectangular cross-section built up of three forgings, each 110 feet long. When assembled, the huge 50,000-ton press will stand ten stories high. It will produce airplane parts now being made by less economical and more complicated methods.

In pouring the huge ingot, heats from two open-hearth furnaces had to be poured in sequence without interruption. Each of the ladles had a capacity of 300,000 pounds of steel, the weight of the ingot being approximately 550,000 pounds. The ingot was cast with a stool weighing 20,000 pounds, and had a sink-head weighing over 100,000 pounds.

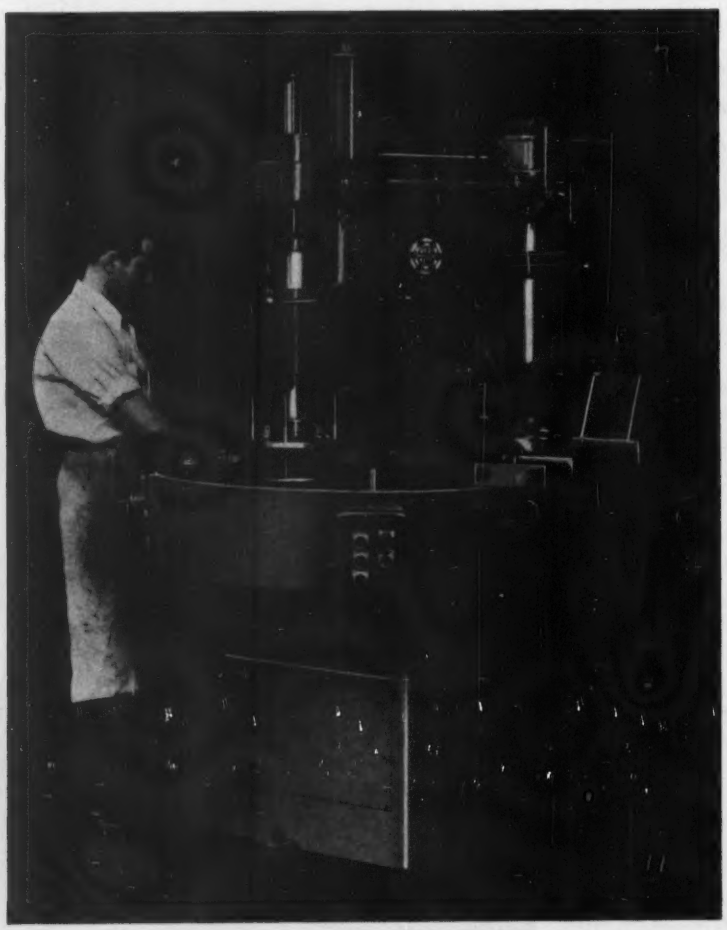
The round corrugated ingot will be forged to shape on a 7500-ton press. When finished, it will be 110 feet long by 16 inches thick. It will be some 40 inches wide except for a width of 100 inches at one end.

Pouring a 275-ton ingot to provide steel for one of the three forgings 110 feet long that will be required for each column of a 50,000-ton press being built under the heavy press program of the United States Air Force.

LATEST DEVELOPMENTS IN *Shop*

"Microflat" Honing Machine for Precision Finishing of Flat Surfaces

The Micromatic Hone Corporation, 8100 Schoolcraft Ave., Detroit 4, Mich., has added several important features to its Model 844 "Microflat" honing machine. Four different spindle speeds for the head and provision for simultaneous changing of spindle and wheel speeds are among the new developments found on this improved model. A motorized wheel dresser has also been mounted on the machine. Accurate control of head oscillation and pneumatic lifting of the spindle are other improvements designed to facilitate production of optically flat surfaces up to 20 inches in diameter and to increase the versatility of this machine.



Improved "Microflat" honing machine announced by the Micromatic Hone Corporation

Changes in the spindle speed of the machine can be made independently of the wheel speed. These changes in speed are accomplished by simply inserting in the machine head either a single-, double-, triple-, or quadruple-thread worm, as the nature of the work requires. The direction of spindle rotation is controlled by a clutch that can be set to any one of three positions, designated "forward," "neutral," and "reverse."

Turning a knob at the lower right-hand side of the machine gives easy access to the unit for changing the spindle and wheel speed. The abrasive wheel is geared to the motor that drives the spindle, so that the speeds of both spindle and wheel can be changed at the same time by one control without changing the speed ratio between the spindle and wheel.

The head can be moved without disturbing its oscillating stroke setting in order to permit the permanently mounted motorized dresser to swing over the wheel into the dressing position. An adjustable stop is provided on the quill housing which permits repetition of height settings and adjustment for wheel wear. This feature saves time when lowering the spindle to the "Microhoning" position for surfacing duplicate or identical parts.

Equipment

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on Market

Edited by FREEMAN C. DUSTON

Diagonal Gear-Shaving Machine Equipped with Automatic Precision Up Feed

The National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, Mich., has announced the development of an important mechanism which can now be built into a diagonal gear-shaving machine. This mechanism provides automatic precision up feed in selected increments throughout the shaving cycle of the gear-shaving machine and automatic return to the proper backlash position for loading and unloading at the end of the cycle. Thus the mechanism gives the user the choice of employing either conventional or diagonal gear-shaving methods in the same machine. It is said to produce finished gears of greater accuracy, permit faster loading and unloading of the work, prolong cutter life, and insure foolproof operation of the machine.

When using the diagonal shaving method, the cycle is no longer limited to two strokes. It may now include several cutting strokes, each with its own increment of up feed and, in addition, one or more idling strokes. Notwithstanding the greater number of strokes, cycle time has been decreased due to the very rapid up feed and the increased cycling speed. Increments of up feed may be constant or varied, but each is precisely controlled.

When employing the conventional shaving method, the operator does not have to use a handwheel to bring the work gear into shaving mesh with the cutter after loading, or lower it out of shaving mesh for unloading. These operations are now a part of the automatic shaving cycle and remove any possibility of producing serration marks on gear tooth surfaces.

The work gear to be shaved is placed between centers and the cycle starting button pressed. The splash doors close automatically, the coolant starts flowing, the table moves upward to bring the gear and cutter into mesh for shaving, cutter rotation begins, and the first shaving stroke gets under way.

At the end of a predetermined number of shaving and idling strokes, cutter rotation stops, the coolant is turned off, the table resumes its initial position and the splash guards open to permit the shaved part to be unloaded.

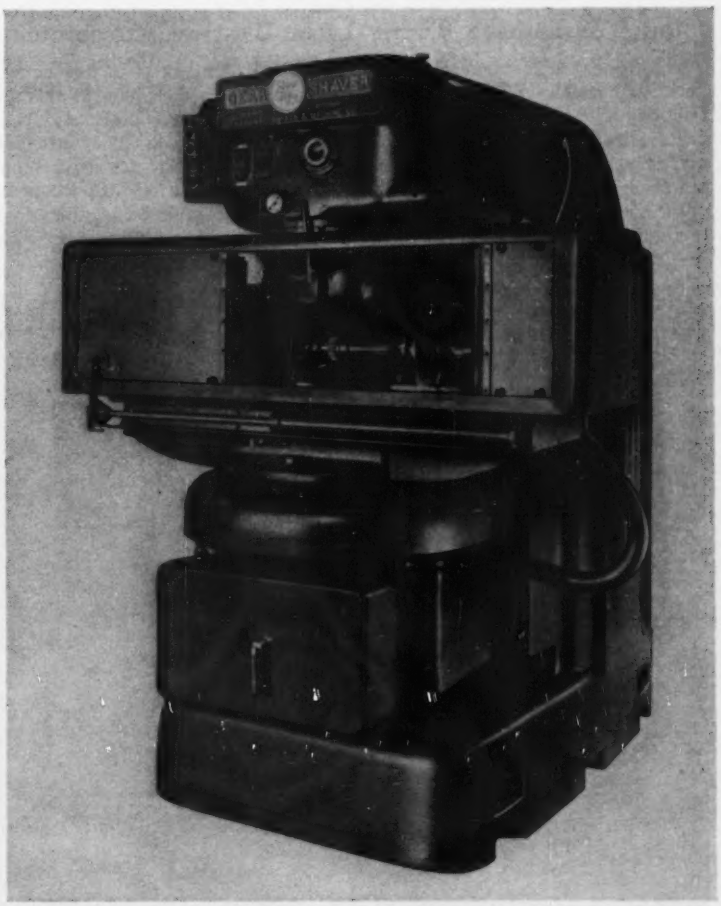


Fig. 1. Diagonal gear-shaving machine equipped with automatic precision up-feed mechanism announced by the National Broach & Machine Co.

Thus the entire cycle is automatic. All the operator does is to unload the finished gear, replace it with an unshaved gear, and again press the starting button.

The amount of up feed is governed by a double-sided master cam which is actuated mechanically to insure that each knee movement is fast, positive, and extremely precise. The master cam is manufactured to accommodate a combination of various feeding cycles. If it is desired to reduce the number of cutting strokes, only part of the cam surface is used in service. The flexibility of the feed mechanism is such that any desired cycle may be employed. Repositioning or changing the cam is a comparatively simple operation requiring only a few minutes.

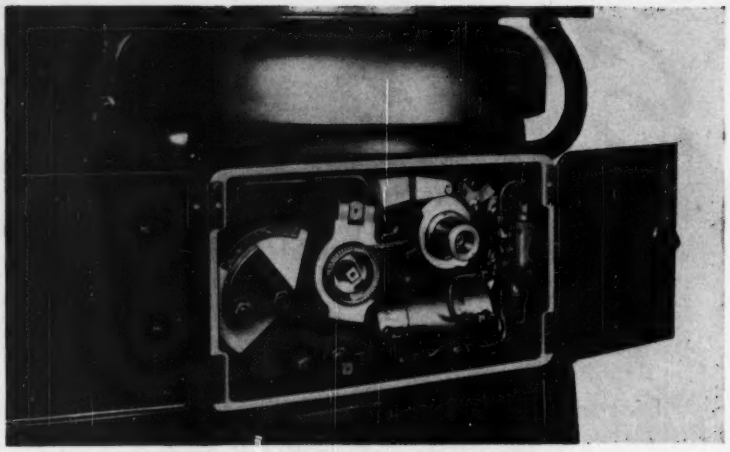
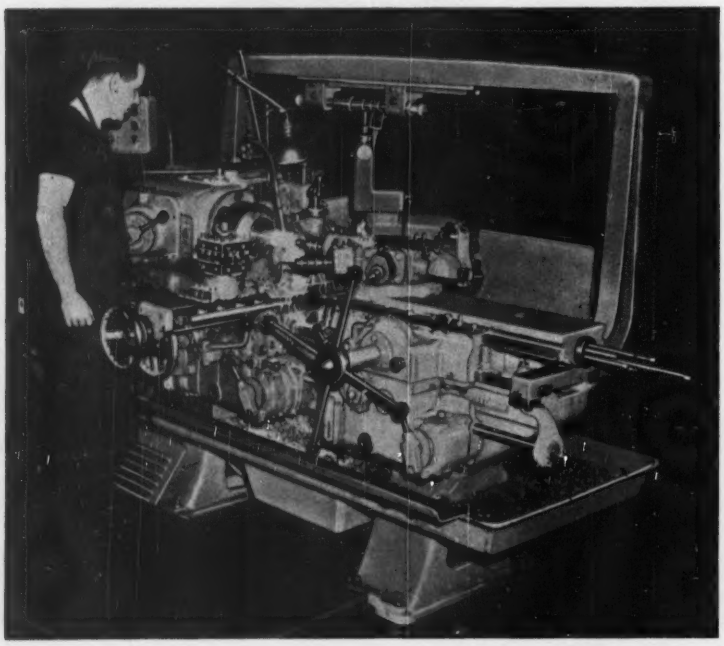


Fig. 2. Close-up view of up-feed control mechanism, housed in cabinet at front of the knee of machine shown in Fig. 1

The up-feed control mechanism shown in Fig. 2 is housed in a closed cabinet at the front of the machine knee. An observation window permits the operator to read a circular scale which indicates the amount of up feed for each cutting stroke.

Jones & Lamson Turret Lathe Tracing Attachment

The Jones & Lamson Machine Co., Springfield, Vt., has just developed a completely new hydraulic tracing attachment for its turret lathes. This attachment is powered by a differential type hydraulic cylinder, and is designed for exclusive use on J & L ram or 7A saddle universal bar or chucking machines for general tracing and multiple-step shaft and contour-turning work. It is intended to meet the need for equipment that will handle certain kinds of work that cannot be machined on an ordinary turret lathe.



Jones & Lamson turret lathe equipped with new tracing attachment

The tool-carrying slide is mounted at an angle of 45 degrees with the spindle axis. The cylinder stylus and the cutting tool are mounted on the back of the cross-slide on a bridge type carriage, thus freeing the square turret for other operations on the same piece.

The tracing attachment can be employed to advantage for turning tapers by using a hardened straightedge, set at the desired angle to serve as a template or former. In addition to the actual tracing and taper-turning functions, this attachment makes it possible to have in one machine the facilities of both a turret lathe and a profiling lathe. Thus, fast "hogging" of stock, threading, or any other turret lathe work can be accomplished without removing the piece. The tracing mechanism can be disengaged by turning a switch. The attachment can be installed in the field.

Wire Brush with Replaceable Filler

A wire-cup brush has been developed by Hewitt-Robins, Inc., Buffalo 5, N. Y., for the removal of rust, scale, paint, and welding slag. The brush consists of inner and outer metal adapters with a replaceable cup-shaped filler in which the wire bristles are anchored in place with rubber. In addition to the economy offered by the replaceable filler, the brush features improved balance, shock absorption, and bristle retention. It will be available in wire gages ranging from 0.014 to 0.028 inch.

Moline Special Machines for Drilling, Reaming, and Spot-Facing Cheeks of Aircraft Engine Crankshafts

The Moline Tool Co., Moline, Ill., has built three special machines designed for accurate drilling, reaming, and spot-facing holes in the cheeks of aircraft engine crankshafts. All three machines are similar in general appearance, but the function of the MR136 shown in the accompanying illustration is the spot-facing of holes which previously have been drilled and reamed in crankshaft cheeks Nos. 2, 4, 6, and 8 by one of two machines. The companion machine drills and reams holes on a different bolt circle in crankshaft cheeks Nos. 4 and 6.

Each of these machines is of the single-spindle type with spindle mounted in a specially designed head unit to suit the restricted space requirements of the workpiece. The crankshaft to be drilled, reamed, or spot-faced is mounted in the fixture, which allows it to be rotated on its axial center line. Thus, it can be turned to the correct position and accurately located for each hole to be drilled or spot-faced.

The head unit carrying the spot-facing spindle on the MR136 machine, and the drilling and reaming tools on the other two machines, can be manually indexed parallel to the axial center line of the crankshaft. A manually operated locator used in conjunction with this indexing mechanism provides means for accurate setting of the spindle unit for different crank throws.

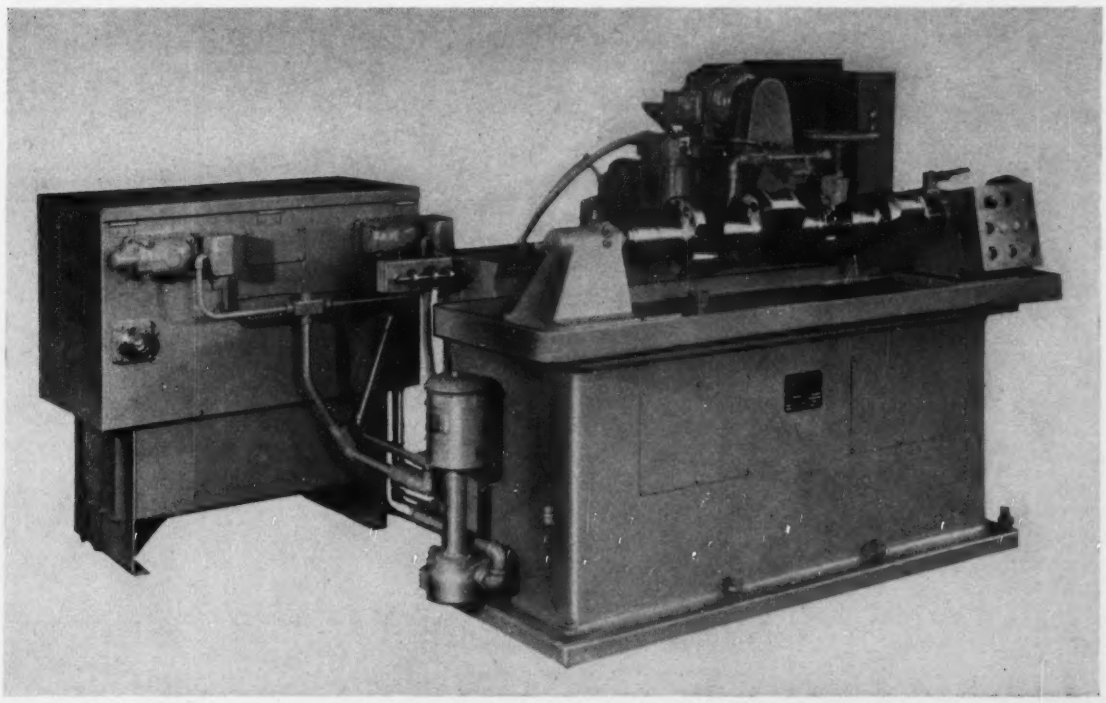
Electrically controlled hydraulic power is used for moving the spindle and cutting tool at right angles to the longitudinal axis of the crankshaft to bring the tool into working position or to withdraw it preparatory to indexing to the next crank throw. The feed travel of the spindle unit for drilling, reaming, or spot-facing is also by electrically controlled hydraulic power. The feed cycle for spot-facing on the MR136 is automatic, and is initiated by push-button control—as is the case for the drilling and reaming feed cycle employed on the two companion machines.

Once the spindle unit is positioned as described, the operator presses the button which causes rapid advance of the tool to the work, proper feed during the drilling operation, and rapid return to the initial starting point. The length and the position of both the rapid traverse and feed portion of the spindle travel are determined by the setting of the adjustable trip-dogs which actuate limit switches at the left-hand end of the machine table. In addition to starting the feed cycle, the push-button station contains emergency control for rapid withdrawal of the cutting tool from the work, or for shut-down of all motors on the machine simultaneously.

Improved Line of Wheels for Grinding Ball-Bearing Raceways

An improved line of rubber-bonded wheels for grinding ball-bearing raceways has been announced by the Bonded Products and Grain Division, Carborundum Co., Niagara Falls, N. Y. These R3 bond rubber wheels have been extensively field tested under a variety of operating conditions.

In production run studies, bearing manufacturers' requirements have been exceeded as to quality



Horizontal single-spindle, hydraulic feed, spot-facing machine for use in the production of crankshafts for aircraft engines, brought out by the Moline Tool Co.

of finish and production rates. The new wheels provide free-cutting action, thereby minimizing generation of heat and insuring a high degree of accuracy. Chatter is said to be virtually eliminated.

In addition to the cool-cutting qualities achieved through the use of these bonded wheels, excellent form-holding characteristics and shape maintenance during the life of the wheels are obtained.

Precision Surface Grinder

The George Scherr Co., 200 Lafayette St., New York 12, N. Y., is placing on the market a new Bruckner surface grinding machine which has a vertical spindle and a cup-wheel. The work is mounted directly on the table or it can be held on a magnetic chuck. The cup-wheel is passed rapidly over the work by hand for rough-grinding. A hydraulic feed is then engaged for finish-grinding. This is said to result in exceptionally high production.

Vertical adjustment of the spindle is by means of a large handwheel. The fine adjustment is by the large-diameter graduated drum reading in 0.0004 inch. The machine uses 7 1/2-inch diameter standard Norton cup-wheels. A diamond dresser is attached directly to the wheel housing so that it is instantly available for dressing the wheel. The machine comes equipped with pump and piping so that it can be used for wet grinding.

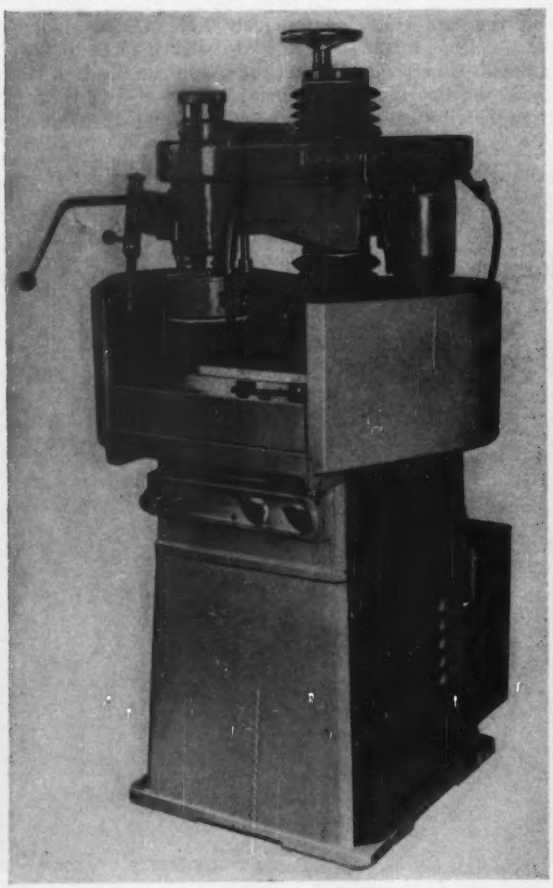
This machine is available in capacities of 5 1/2 by 13 1/2 inches and 4 1/2 by 15 inches. The permanent magnet chuck is 14 1/2 by 6 inches. The greatest distance between wheel and table is 11 inches, and between chuck and wheel 8 1/4 inches. Power is furnished by a 1 1/2-H.P. 220-volt 60-cycle three-phase motor.

Erie Giant Size Steam Drop-Hammer

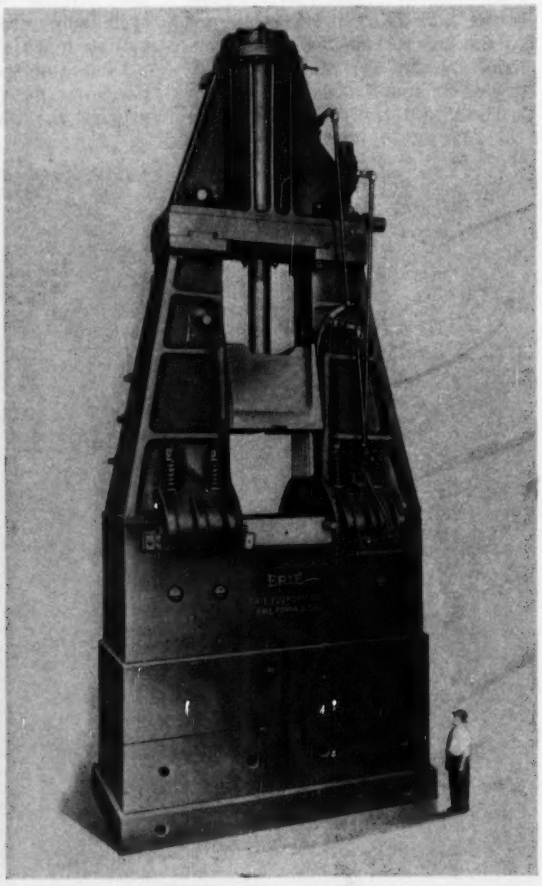
A huge steam drop-hammer having a rated capacity of 50,000 pounds has recently been built by the Erie Foundry Co., Erie, Pa. It is said to be the largest steam drop-hammer ever installed in this country. The shipping weight of the completed hammer, without dies, is in excess of 800 tons. When erected, it extends 16 feet below and 30 feet above the floor.

Despite its huge size, this machine can be easily controlled by one man using a foot-treadle or hand-levers. Features include a system of unusual design for lubricating the V-guides and a distribution valve of a new counterbalanced type which permits extremely sensitive control.

The bottom cylinder head is integral with the cylinder, and is turned on the outside so that it serves as a huge dowel between the cylinder and the tie-plate.



Precision surface grinder introduced by George Scherr Co.



Steam drop-hammer of giant size built by Erie Foundry Co.

Bullard Vertical Chucking Grinding Machines

A precision vertical chucking grinding machine built in six sizes to meet present-day requirements for convenient grinding of large work has been announced by the Bullard Co., Bridgeport 2, Conn. Features developed as a result of years of study of the requirements for a highly accurate machine of this kind have been incorporated in this new model. It is available in 30-, 36-, 42-, 54-, 64-, and 74-inch sizes, and is designed and built for ruggedness and rigidity, combined with sensitivity of control. The first machine of this line is now in operation at the plant of the Timken Roller Bearing Co., Canton, Ohio.

The combined use of mechanical, hydraulic, and electrical components in this machine is said to provide exceptional accuracy, flexibility, and power, as well as easy operation. A variable-speed drive provides stepless changing of table speeds, from creeping to top speed, as specified. Reversing controls permit the grinding spindles to be run in either direction. Grinding spindle speeds can be furnished to meet requirements, with maximum rating of 10 H.P. for the main-head grinding spindles and of 5 H.P. for the side-head grinding spindles.

The grinding heads are equipped with hydraulic drives designed for extremely smooth reciprocating action. The rate of reciprocation is controlled by a selector dial having twelve fixed orifice type valves for metering the flow of oil. This control permits the operator to select any one of twelve reciprocating speeds. Ideal grinding conditions can be easily repeated by turning the dial to a numbered orifice position.

A fine feed and an adjustable dwell are provided for grinding up to shoulders in combination with any of the reciprocating speeds. This fine feed and dwell can be used together or independently, and can be set for the bottom, top, or both ends of the stroke. Readily adjustable cams control the length of stroke, and positive stops assure accuracy. The main head can be swiveled 30 degrees to the right or left of center, and the side head 20 degrees above or below the horizontal position.

Dual control desks with push-button controls, as shown in Fig. 1, provide maximum ease and efficiency for machine operation. Being located one on each side of the machine, an operator can control the machine from the more advantageous side. Desks are interlocked so that only one is operable at a time.

To obtain the greatest possible rigidity and accuracy, the grinding wheels are mounted on the motor armature shaft. The grinding spindle housing incorporates the motor field. Hardened and ground square lock-ways for both heads are concealed and protected within the head housings. (The cylindrical grinding wheel hous-

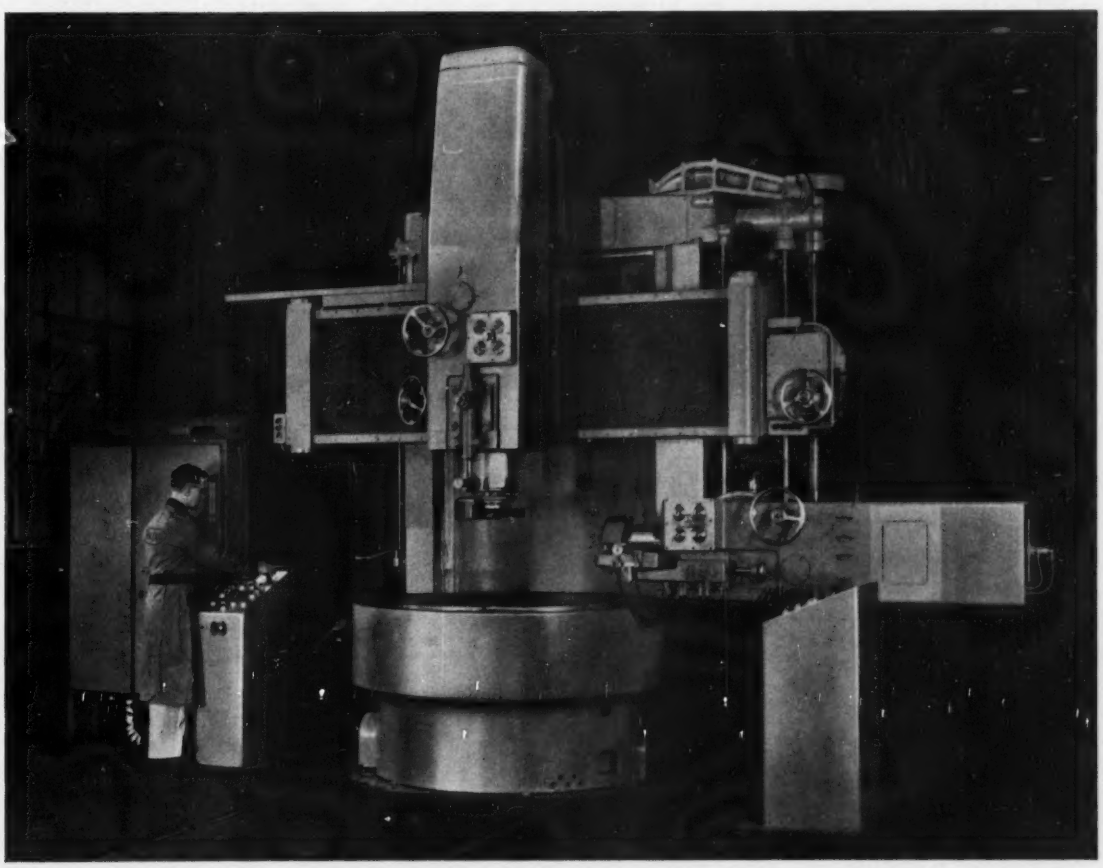


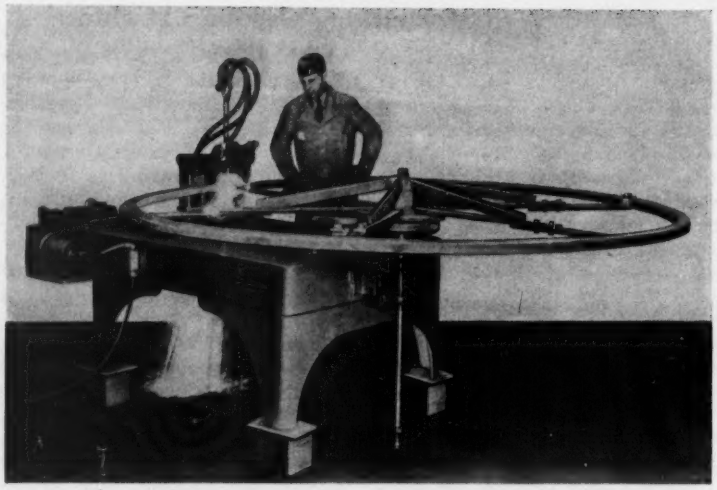
Fig. 1. Vertical chucking grinding machine now built in six sizes by the Bullard Co.

ing or motor frame does not constitute a reciprocating bearing member.) Grinding spindles can be readily removed from the square lock-slide within the head, permitting a spare spindle to be quickly installed.

Non-metallic surfaces bear against the hardened way, and adjustable taper gibs are provided to give maximum uniform rigidity. Grinding slides always have a full bearing in the heads. Overhang is constant for all grinding strokes. All exposed bearings are protected by grit shields and scrapers. The neoprene guard for the cross-rail bearings is ribbed with steel stays to assure a tight fit. Infinitely variable reciprocating speed, hydraulically operated wheel dressers are built into each head. The construction is such that the wheels can be properly dressed to specific requirements without upsetting the grinding cycle. Wheel dressers are equipped with their own independent reciprocating ways, and therefore can be adjusted to obtain the best dressing conditions.

Trabon lubrication systems are installed on the main and side heads. These units distribute metered oil to all bearings requiring lubrication at a rate adequate for each particular bearing. The units are interlocked so that they pump only when oil is required and when the grinding spindles are in operation.

Special attention has been given in the design of the machine to the safety of the operator. Electrical interlocks are provided so that the machine cannot be started unless the work is properly held by the magnetic chuck. Lock-out switches are also provided to render the machine inoperative while setting switch cams for length of grinding strokes. Swiveling wheel guards provide maximum safety for the operator and afford easy access to grinding wheels.



Flame-cutting machine which has been developed by the Cogmatic Co.

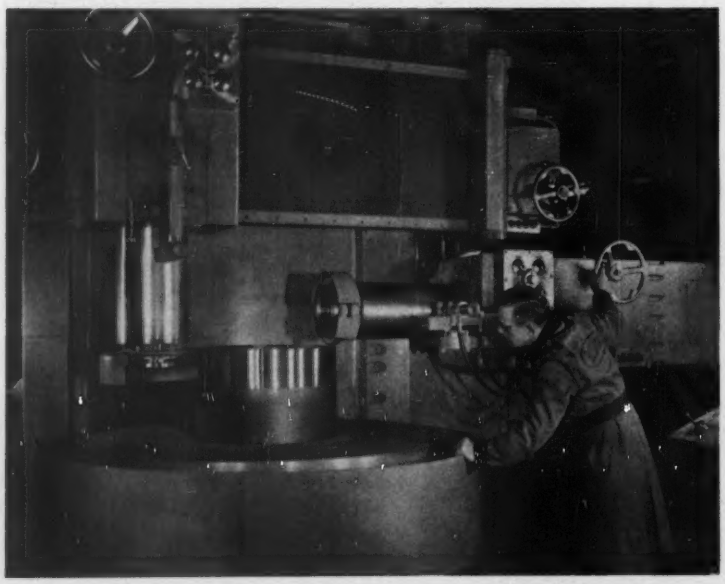


Fig. 2. Performing cylindrical and face grinding operations using vertical and horizontal spindles of machine shown in Fig. 1

Cogmatic Flame-Cutting Machine

A three-spindle flame cutter for producing gears and sprockets has been announced by the Cogmatic Co., 1330 N. Franklin Place, Milwaukee, Wis. This equipment is said to cut alloy steel as quickly as mild steel, and to harden the work while cutting, through the use of a coolant stream. The spindle attachment shown in the illustration makes it possible to produce sprockets or gears that are actually larger than the machine itself.

The new multiple-spindle design also permits automatic production of three gears or sprockets at a time, in diameters up to 15 inches, or two at a time up to 25 inches in diameter. This flame cutter will automatically produce over 300 shapes and sizes of teeth, 5 to 200 teeth per wheel, in a diameter range of 3 to 108 inches.

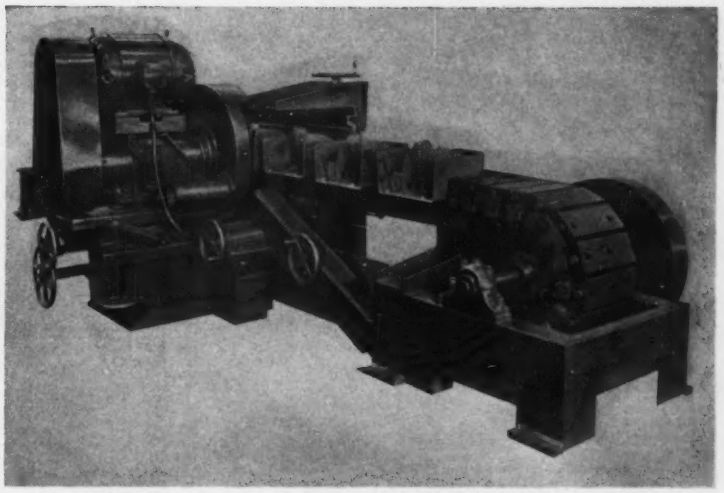
Standard Line of "Illinite" Cutting Tools

A new line of standard cutting tools, including a complete selection of standard end-mills, saws, milling cutters, key-slot cutters, hobs, and shaper cutters, has been added to the cutting tools made by the Illinois Tool Works, 2501 N. Keeler Ave., Chicago 39, Ill. The new tools will be distributed under the trade name "Illinite," and will include gear measuring blocks, tool bits, die filing machines, and die files.

Gardner Special-Purpose Grinder

A machine designed especially for grinding the back edge of sinks and lavatories on a high-production basis, but adaptable to similar work, has been built by the Gardner Machine Co., 414 Gardner St., Beloit, Wis. The base of this machine supports a heavy-duty grinding head mounted on ball-bearing ways, and carries a Gardner "Wire Lokt" abrasive disc. A centralized type lubrication system is provided for the ways.

A long chain type conveyor operating at a speed of from 8 to 24 feet carries the sinks and lavatories past the grinding wheel. A special hold-down device supports the work during the grinding operation, which consists only of straightening the back edge of the sink or lavatory where it fits against a wall. Stock removal on this work runs as high as 1/16 inch in some cases.



Special surface grinding machine built by the Gardner Machine Co.

Victor Hacksaw Blades

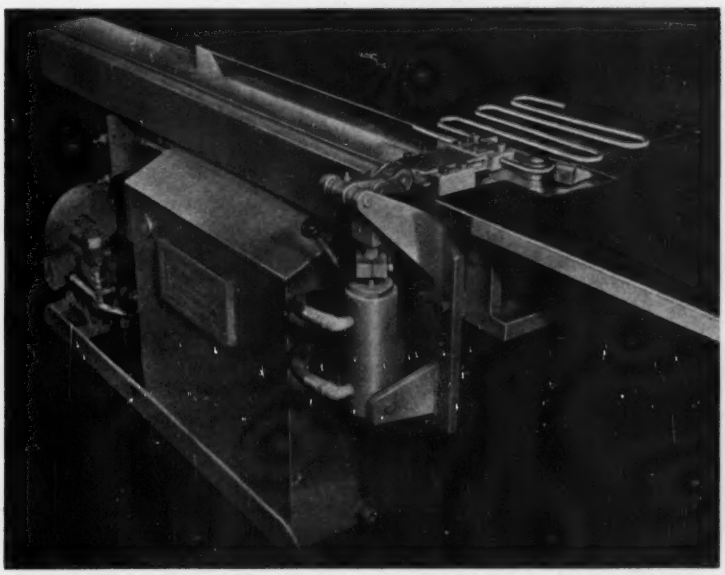
The Victor Saw Works, Inc., Middletown, N. Y., is now manufacturing hacksaw blades in a new range of sizes to meet the industrial standards recently adopted after two years of study and research by the Hack Saw Manufacturers Association of America, Inc. The new schedule is designed to streamline inventory and, at the same time, provide an efficient blade for every metal-cutting need. In establishing the standard, a definite ratio between blade width and thickness was followed. Blades manufactured in sizes up to 30 inches in length have a width twenty times their thickness.

Pines Semi-Automatic Bender Designed to Simplify Bending of Serpentine Coils

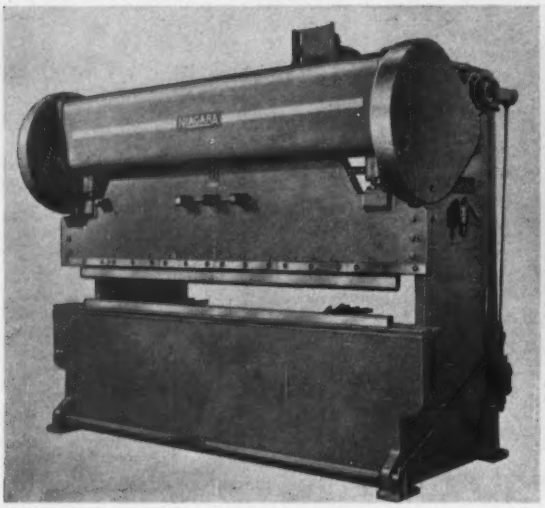
A low-cost small bender of the semi-automatic type designed to suit production line needs has been brought out by the Pines Engineering Co., Inc., 601 Walnut St., Aurora, Ill. This unit is equipped with a single control lever, a stationary bending form, a rotating wiping shoe, and a semicircular table to maintain long coils in a horizontal position during the sweep of the bending cycle. The control is arranged so that the operator can conveniently handle the positioning of the work-piece with ease and speed.

In bending continuous serpentine coils, the first bend is completed in a conventional manner, after which the stock is rotated 180 degrees before clamping for succeeding bends. One movement of the operating lever initiates the entire clamping and bending cycle. The rotating wiping shoe is designed with a curved face, and operates with a cam effect. This allows the operator to return the wiper immediately after completing the bend by reversing the operating lever. Production averages 450 bends per hour.

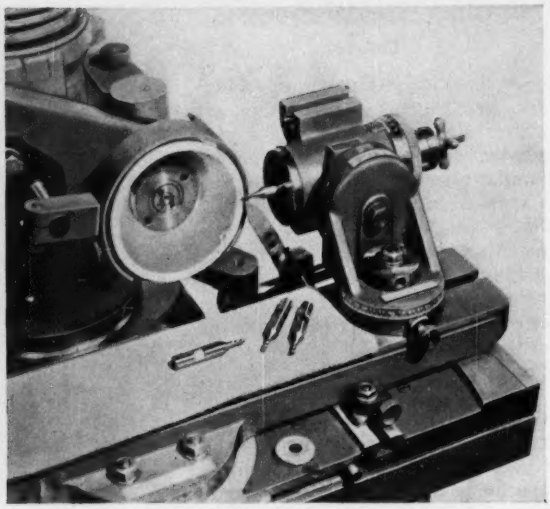
This machine will handle tubing up to 1 inch outside diameter, 16-gage, and 5 feet in length. The machine has a die height from the floor of 35 inches, and a base 74 1/2 by 15 inches. The unit is equipped with a Vickers self-contained power pack, which provides a bending speed of 29 R.P.M. A 3-H.P. motor is used, and pump delivery is 7 gallons per minute at a pressure of 1000 pounds per square inch.



Pines semi-automatic bender showing wiping shoe at the end of bending cycle



All-steel press brake of new line brought out by the Niagara Machine & Tool Works



Sharpening attachment for small end-mills marketed by the Brown & Sharpe Mfg. Co.

Niagara All-Steel Press Brakes

A new line of all-steel press brakes which includes 50-, 100-, and 150-ton series machines is being announced by the Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo 11, N. Y. Bending, curling, jogging, corrugating, and punching are only a few of the many operations performed by these machines.

Laminated non-metallic ways of the press brake are designed to maintain accurate alignment and reduce wear to a minimum. Double reduction gearing and double-end twin drive with gearing enclosed in sealed baths of oil provide a smooth, balanced, efficient means of transmitting power to the ram. The powerful air-cooled clutch and brake can be controlled either by foot-treadle or palm buttons fastened to the ram which permit jogging, single stroking, and continuous operation. With a motor reversing switch, the flywheel can be reversed to pull the ram out of accidental stalling.

A deep crown and twin-plate bed permanently welded to the side frames form a rigid one-piece frame developed to maintain accurate alignment with minimum deflection. Self-locking, power-operated ram adjusting screws are fitted with micrometer dials to permit duplication of settings for repeat jobs. By uncoupling the shaft between the screws, the ram may be tilted by power for tapered work. Gages can be supplied for the front or rear of the machine. Also, angle press support brackets and bolster plates can be furnished to convert the brake for stamping operations.

Electric Casting Furnace

To meet the need for an efficient method of producing precision castings, especially in the jet aircraft field, the Detroit Electric Furnace Division, Kuhlman Electric Co., Bay City, Mich., has introduced a Type IC, 12-kilowatt 10-pound indirect-arc electric furnace. This furnace consists of a melting chamber and transformer combined in a single unit. The melting chamber has a two-piece refractory unit seated in granular insulation, and is provided with tubular entrances for electrodes and for pouring. The investment mold is clamped on the shell faceplate by means of compressed air.

The transformer is of the 17-kilovolt ampere adjustable reactance, Class B, dry type, available for operation on either 220- or 440-volt, 60- or 50-cycle, single-phase current. Pouring is done by simply inverting the furnace and allowing the molten metal to run into the clamped-on mold. As soon as the metal has solidified, the air pressure is released, the mold removed and the furnace returned to the melting position. The average melting rate is 6 pounds in nine minutes.

B & S Attachments for Sharpening End-Mills

Two end-mill sharpening attachments have just been added to the line of cutter and tool sharpening equipment made by the Brown & Sharpe Mfg. Co., Providence 1, R. I. The No. 5 sharpening attachment for small end-mills shown in the accompanying illustration and a No. 10N attachment of similar design are now available for use on the No. 5 and No. 10N Brown & Sharpe cutter and tool grinding machines.

The peripheral and end teeth of straight shank end-mills from 1/8 to 3/8 inch in diameter can be quickly and easily sharpened by using these attachments. Their sensitive, free-turning spindles are of special advantage when sharpening very small end-mills having steep-spiral peripheral teeth. In operation, the tooth being sharpened is held in contact with the tooth rest while feeding the cutter across the wheel by longitudinal table movement. A small knurled area at the end of the draw-in bolt gives extremely sensitive control of the work.

The spindle of the No. 5 attachment is carried in a body that is fastened to the center head furnished with the No. 5 machine. This permits setting to an angle in both a horizontal and a vertical plane, with rigid clamping provided for both adjustments. The spindle of the No. 10N attachment is carried in a body that is

fastened to the work-head knee of the B & S No. 10N machine by means of a plate and bolt furnished with the attachment. Provisions are made in both attachments for making accurate angular settings in both horizontal and vertical planes.

Scrivener "Super-Surface" Grinding Machine

The Kelvin Systems Corporation, 135 Front St., New York 5, N. Y., is introducing in this country a Scrivener 8- by 18-inch "Super-Surface" grinding machine. This machine is especially designed for accurate tool-room work. Its massive construction and bearings also make it well adapted for continuous, heavy stock removal on production work.

The large grinding wheel is mounted on a Nitralloy spindle of extra large diameter. Plain bearings with built-in adjustment for wear and a complete lubrication system are employed for the spindle. The table takes a full-size vise. All table movements and the cross-feed or vertical adjustment of the wheel-head can be effected by hand or power. A truing device permits the wheel to be dressed in a matter of seconds without disturbing the work. The long table is provided with suitable water channels for wet grinding and with T-slots for work-holding fixtures.

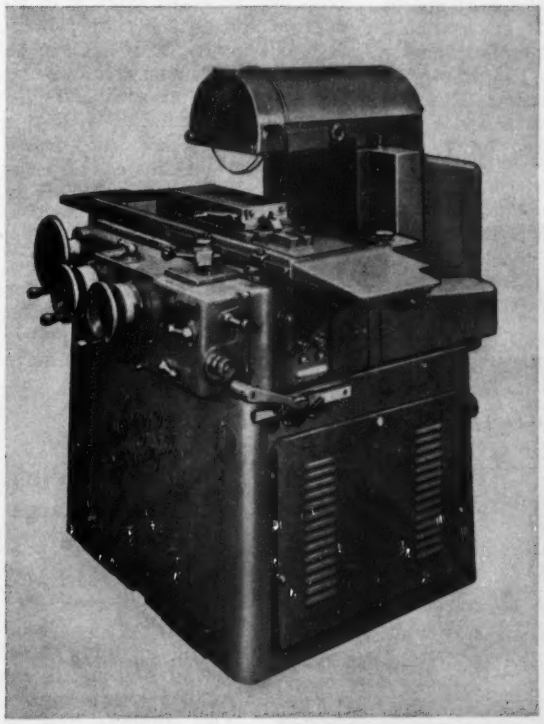
The column is a heavy casting, carried on lubricated vertical ways, and is actuated by means of an over-size lead-screw with anti-friction thrust bearings for the special rotary nut. Power vertical traverse is available in both directions, operating to within 1/2 inch of the travel limit. At this point a switch cuts out the power feed, leaving the column to be manually operated for the last 1/2 inch of travel. Thus any possibility of damage through inattention or carelessness is eliminated. Collapsible guards cover the ways in all positions of the head.

The machine is normally supplied for dry grinding. If required for wet grinding, a coolant tank with independent motor-driven pump, piping, fittings, and splash guards can be supplied.

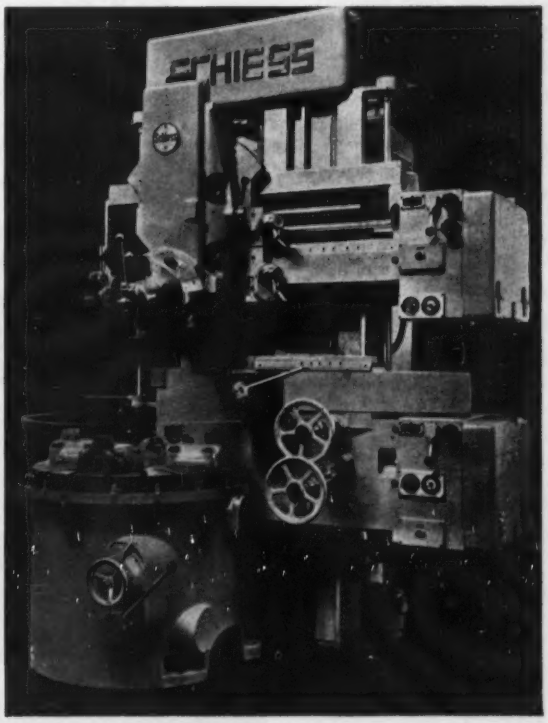
Schiess Single-Column Vertical Turret Lathes

Schiess single-column vertical turret lathes primarily intended for high-speed machining with carbide tools, which were shown for the first time at the recent Machine Tool Exhibition in Hanover, Germany, are now being distributed in this country by the Kurt Orban Co., Inc., 205 E. 42nd St., New York 17, N. Y. These Series "KE" lathes are available in three lengths with turning capacities of 39, 49, and 65 inches. They have an all-vertical gear drive with the main motor mounted in a vertical position on the back of the machine and directly connected to the gear-box through a vibration-absorbing coupling. The gear-box is also vertically mounted so that the drive is direct to the table. This eliminates the need for an angular or bevel gear drive, and thus removes a possible source of vibration.

The table moves on tapered roller bearings. The vertical ram, cross-rail, and side-head are all counterbalanced. A single lever unlocks, raises or lowers, and



Scrivener surface-grinding machine distributed by the Kelvin Systems Corporation

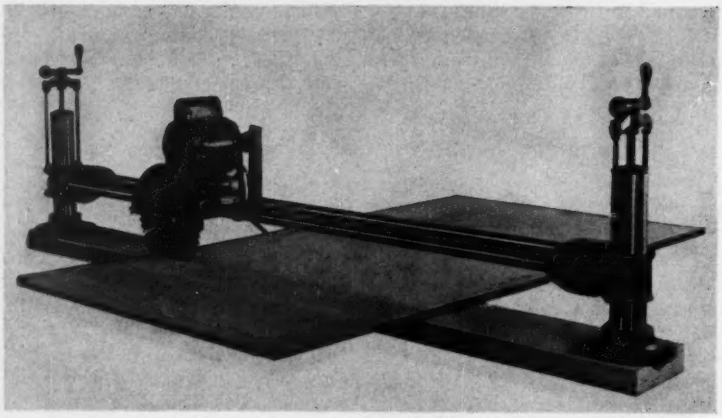


Schiess vertical turret lathe introduced in this country by the Kurt Orban Co.

locks the cross-rail simultaneously by electro-mechanical controls. Hydraulic pre-selection of speeds can be made while the table is rotating. The desired speed is set by a handwheel and read on an illuminated dial. A stop-button slows down the table and a shift lever engages a new speed in a fraction of a second. There are sixteen spindle speeds in a ratio of 1 to 50. The maximum table speed is 310 R.P.M.

Direction of feed and rapid traverse are actuated by spring-loaded mono-lever controls—one for normal feeds, another for rapid traverse. The mono-levers are moved in the same direction as the desired feed or traverse movement, thus simplifying correct setting by the operator. Specially designed electro-magnetic disc clutches disengage the feed instantly with no overriding or coasting.

A copying attachment with electric tracer can be supplied for use either on the cross-rail and vertical ram or on the side-head, as required. This unit can be attached to any "KE" machine. Provision is made for cutting threads, the range being from 1 3/8 to 30 threads per inch.



Long-railed saw for cutting wide sheets made by Hendrick Mfg. Corporation

Hendrick Long-Railed Saw for Cutting Wide Metal and Plastic Sheets

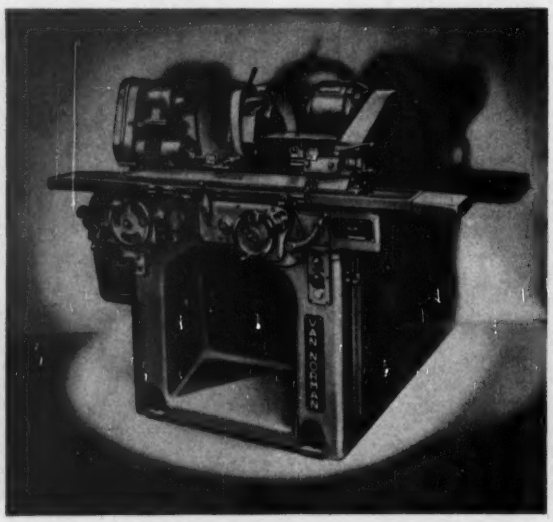
A long-railed saw designed for low-cost cutting of large sheet stock has been announced by the Hendrick Mfg. Corporation, 11 Selman St., Marblehead, Mass. This machine is available with rails up to 10 feet in length, and can be used for cutting large sheets of metal, plywood, or plastics in sizes up to 4 by 8 feet. The rails can be tilted from 0 to 90 degrees for mitering or rabbeting, and the depth of cut can be controlled by raising and lowering the screw jack at each end. In cutting sheet material with this machine, the saw is drawn through the stock instead of pushing the stock across the saw table.

Hollow-ground or carbide-tipped saw blades can be employed for high-production cutting of plywood or plastic sheets, and an abrasive cutting wheel in cutting metal sheets.

Van Norman Cylindrical Grinder for Production Grinding of Small Parts

The Van Norman Co., Springfield 7, Mass., has announced a "418" grinder especially developed for fast precision traverse or plunge cylindrical grinding of small parts on a production basis. This grinder is particularly adaptable for economical grinding of small parts in tool-rooms and job shops where work is usually in small or medium-size runs. It requires a minimum floor space and has a base of recessed design which permits the operator to sit comfortably at the machine. All controls are conveniently grouped within easy reach from the operating position. Work-pieces are loaded, ground, and unloaded with minimum motion and effort.

Outstanding features of this machine include a Pope wheel-spindle, wheel-slide rapid retraction, and a well proportioned slide constructed for rigidity and maximum accuracy. Provision is made for automatic starting and stopping of headstock and table traverse, and semi-automatic lubrication. Grinding wheel speeds of 1772 and 2067 R.P.M. and headstock work speeds of 153 to 940 R.P.M. are available. Work up to 4 inches in diameter and 18 inches in length can be ground between centers. This machine requires a floor space only 43 1/2 inches deep by 79 1/4 inches wide.



Van Norman cylindrical grinding machine

Optical Dividing Head with Large Faceplate

The F. T. Griswold Mfg. Co., Devon, Pa., is building a special optical dividing head having a faceplate capacity of over 48 inches. This dividing head is said to make possible angular settings that

are accurate within 3 seconds. It will be used in the machining of large jet-engine components.

To obtain settings by entirely optical means, a circular scale is employed on which degree lines are etched, from 0 to 359 degrees. This scale is illuminated, and degree lines are magnified and projected onto a ground glass screen. Minutes and seconds are marked on a circular dial which has 15-second divisions, and degrees are aligned between reference marks on the screen. Direct visual reading is obtained, no focussing is required, and the operator can quickly note any unbalance between reference lines. Thus, accurate positioning is obtained.

P & W Precision Tilting Rotary Table with Built-In Power Unit

A precision tilting rotary table 24 inches in diameter has been added to the line of machine tool equipment made by Pratt & Whitney Division of Niles-Bement-Pond Co., West Hartford 1, Conn. This table is designed to produce very accurate work, and is provided with a built-in power rotation unit. These features have been combined to make the table exceptionally versatile.

Power rotation is provided by a three-phase, 1/2-H.P., shell type motor unit built into the table pivot. Motor design and location are such that mechanical shocks are minimized. The table can be rotated through 360 degrees in either direction and in any plane of arc by the use of push-button controls. For fine adjustments, the table is rotated by the use of a handwheel with a self-centering spinner knob. Table graduations in degrees are read directly off the table, while minutes are read on the rotary wheel dial. A vernier used in conjunction with the rotary wheel dial brings readings down to 2-second intervals. A sliding pointer on the side of the table bed can be set at zero anywhere along a 45-degree arc.

The rotary table can be tilted from 0 through 90 degrees. A rapid elevating handwheel is provided for fast positioning. Table arc settings are made in degrees using a graduated quadrant on the face of the table pivot. A vernier on this scale subdivides to 1 minute. For more accurate positioning of the table arc, the sine bar method is used. This method involves a simple triangulation problem, using the desired angle to obtain the unknown height of the triangle. Precision gage-blocks equal to this calculated height are then placed on the ground and lapped platform, and the table lowered until the measuring pin on the table bed touches the top of the gage-blocks, as shown in Fig. 2. Accuracy in seconds up to a 45-degree elevation can be obtained in this manner. The table is equipped with simple, positive lever binders, thus eliminating the need for wrenches. Another unique feature is the elevating worm-gear which provides means for taking up backlash.

Pedestal tool grinder announced by the South Bend Lathe Works

South Bend Pedestal Tool Grinder

A pedestal tool grinder built for easy operation and trouble-free maintenance has been placed on the market by the South Bend Lathe Works, 425 E. Madison St., South Bend 22, Ind. This grinder has been designed to provide plenty of work room around the grinding wheels, and to insure smooth operation with practically no vibration.

The grinder can be furnished with either 8-inch grinding wheels and a 1/2-H.P. motor, or with 10-inch wheels and a 3/4-H.P. motor. It is compactly built, measures 49 1/2 inches high, 18 1/2 inches wide, and 20 1/2 inches deep. There is no motor between the wheels of this tool grinder, a wide open space being left around

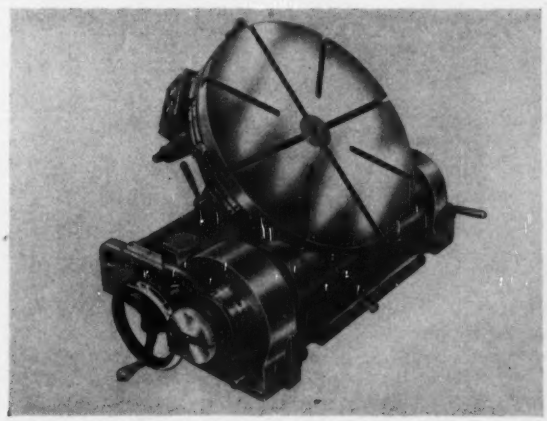


Fig. 1. Tilting rotary table with built-in motor for power rotation brought out by Pratt & Whitney

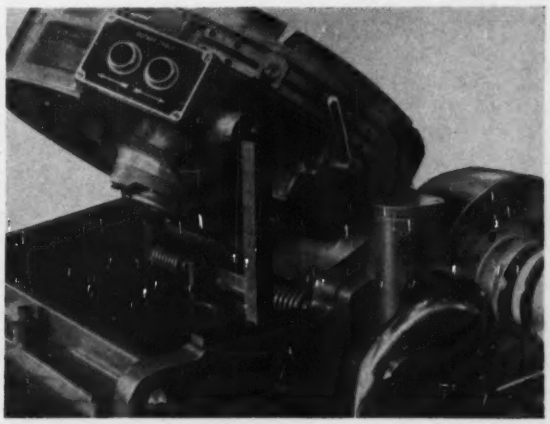


Fig. 2. Close-up view illustrating method of using gage-blocks for angular setting of table seen in Fig. 1.

each grinding wheel which permits the operator to handle work faster because his arm movements are never cramped. Since the motor is mounted in the pedestal, it is protected from abrasive dust. This design feature also serves to remove the weight of the grinding wheels from the motor bearings. The grinding wheel spindle runs on sealed ball bearings which combined with the fully enclosed V-belt drive produces a quiet, vibration-free running condition.

The grinding wheel spindle is set forward on the pedestal to provide even more work room around the grinding wheels. This offsetting of the spindle also allows more toe room for the operator while standing at the machine. Large-size eye-shields provide sturdy optical protection at each wheel. Two concealed lamps in each shield give plenty of light for freehand precision grinding. Wheel guard castings are made extra thick for operator safety, and their large dust outlets facilitate making connections with a dust exhaust system.

Minor features, but nevertheless contributing to over-all efficiency, are the larger size water pot which is removable for cleaning, push-button motor switch conveniently located at waist level, and the U-shaped tool-rests adjustable to any angle and also adjustable for wheel wear.

Bench Type Rolling Fixture for Checking Gears with Integral Shafts

A new Model 602-A bench type rolling fixture designed to check size, eccentricity, and roll smoothness of cluster and similar types of gears having integral shafts and centers is announced by the Michigan Tool Co., 7171 E. McNichols Road, Detroit 12, Mich. The fixture has a heavy cast-iron base, scraped ways, and hardened and ground ball ways. It has a spring-return, lever-controlled retractable upper center. Center distance is adjustable from 2 to 10 inches. The maximum distance between centers on the over-arm is 12 inches.

Gears to be checked are loaded between centers on the over-arm, and the master gear is brought into mesh with the gear to be checked by an eccentric lever control. Correct tension between the gears is maintained by spring-loaded ball ways. Turning the gear manually causes a 0.0005-inch indicator to show variations in size, eccentricity, and roll smoothness.

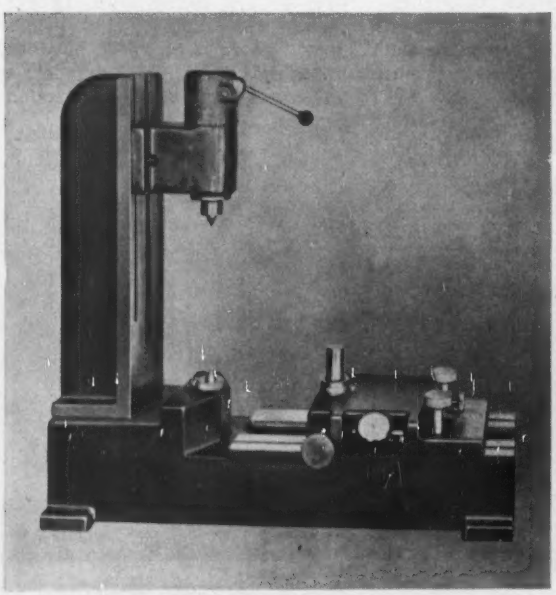
The Model 602-A fixture is 9 1/2 inches wide, 29 inches long, and 26 1/4 inches high. It can be used in conjunction with the Michigan Model MTR-50 automatic recorder, thus making it possible to place all readings on permanent charts.

Flattening and Tempering Furnace

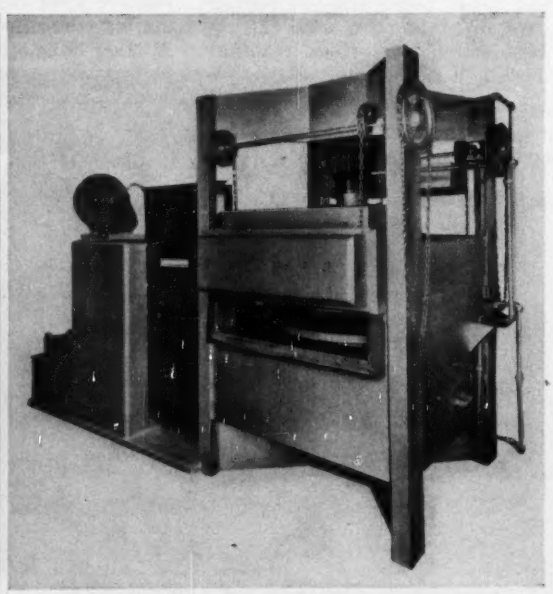
A flattening and tempering furnace with a temperature range of from 350 to 1000 degrees F., designed for flattening and tempering large, thin, circular pieces such as circular saws, has just been announced by the Waltz Furnace Co., Department 3, 1901 Symmes St., Cincinnati, Ohio. The furnace is of the gas-fired recirculating type. The burner fires into a combustion chamber on the inlet side of the recirculating fan, and the combustion blower is mounted on top of the air duct.

The Vickers hydraulic unit is mounted on the base at the extreme left. Inside the furnace are two large circular cast-iron dies, 42 inches in diameter. One die is fastened to the bottom end of the cylinder rod with a ball and socket joint; the other (the bottom die) rests on a steel structure but is not fastened rigidly. The hydraulic cylinder can be seen in the illustration just above the door.

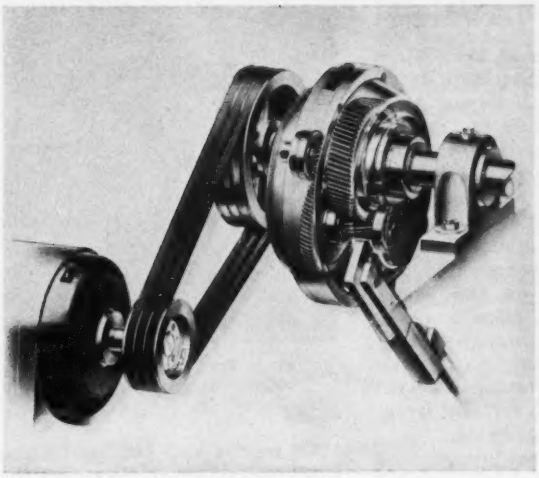
Doors on both sides of the furnace provide easy access from either side. The control panel can be seen between the air duct and the furnace structure.



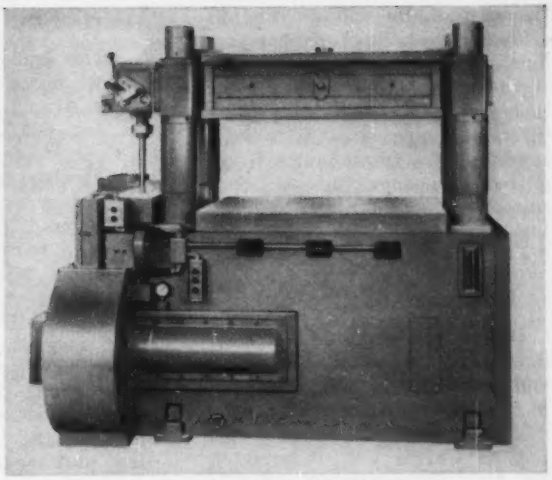
Michigan bench type rolling fixture for checking gears



Waltz furnace for simultaneously flattening and tempering



"Shaft-King" speed reducer of new series introduced by the American Pulley Co.



Press for trying out dies is being manufactured by the Alpha Tool Works

Shaft-Mounted Speed Reduction Drives

The American Pulley Co., 4200 Wissahickon Ave., Philadelphia 29, Pa., is marketing "Shaft-King" 20-to-1 ratio speed-reduction units featuring important improvements in gears, bearings, housing, lubrication, and oil sealing systems. The gearing in these speed reducers consists of two trains of the single-helical type, the gears being precision-cut from alloy-steel forgings and heat-treated by flame-hardening.

Both ball bearings and tapered roller bearings are employed in these drives according to where they can be most effectively utilized. Longer bearing and gear life is also said to be made possible by the exclusive three-wall housing. Gearing and bearings are continuously splash-lubricated by the high-speed gear and the countershaft pinion which run in a large oil reservoir in the lower third of the housing. The concentric shaft design places both input and output shaft above the oil level so that the bearing seals do not operate against a head of oil. An additional feature is a leakproof, anti-friction oil-sealing system.

Interchangeable split tapered bushings with locking nuts eliminate fretting corrosion and make the units immediately adaptable to any shaft size up to 3 15/16 inches in diameter. The speed reducers are mounted directly on the shaft of the driven machine and require only standard shaft lengths (twice shaft diameter plus clearance) for mounting. As protection against shocks, jams, or built-up loads, these speed reducers can be equipped with a torque-arm overload release.

Die Tryout Press

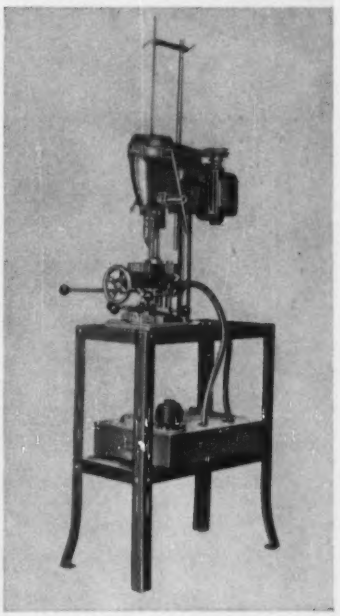
The Alpha Tool Works, 9281 Freeland Ave., Detroit 28, Mich., have brought out a 100-ton die tryout press incorporating many new features. The press occupies the comparatively small floor space of 75 by 84 inches and has an overall height of 82 inches. The head can be quickly released and rotated to any point through an angle of 240 degrees. This permits the operator to spot, shear, fit, and finish both punch and die without removing the die from the press.

The four-post construction of this press is designed to assure accurate alignment of both punch and die. The drive mechanism is housed in the base and pulls the press head downward. The air-operated clutch is of the combination flywheel type with multiple-disc brake. The electrical controls of the clutch are designed to permit inching, single stroke, continuous operation, and forward or reverse operation.

Two hand safety push-button controls and one emergency stop-button are standard equipment. Capacity is figured at pin-point tonnage for any position in the bed. The Alpha die tryout press has a 6-inch stroke and operates efficiently at 50 strokes a minute. Force-feed lubrication is supplied to all working parts.

Turnomat Machine

A small machine has been added to the line of Karge Turnomat attachments for lathes and drill presses manufactured by the Turnomat Co., Inc., Department 11, Brockport, N. Y. This complete machine is designed to do practically everything the larger



Complete turning machine brought out by the Turnomat Co., Inc.

Turnomat units will do, and to release large lathes for other production work. It has a capacity for handling bar stock up to 1 3/4 inches in diameter, using four interchangeable heads. With these heads, only a few minutes is required to change the bar stock capacity from 1/32 inch to 1 3/4 inches.

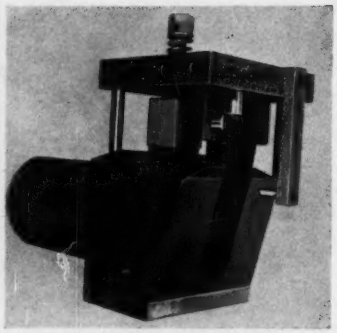
Improved Dill Slotter

Design changes and "streamlining" to insure greater safety and easier maintenance have been incorporated in the improved model of the Dill slotter by the Lobdell United Co., Wilmington 99, Del. Improvements on this versatile machine tool include a completely enclosed counterweight on the ram, comprising a bank of counterweights which slide up and down within a machined housing; force-feed lubrication, supplied by two hand-operated oil pumps which circulate oil to all moving parts; and a new gear guarding arrangement designed to enclose all moving gear banks in sections.

"Micro Pin" Tool Setter

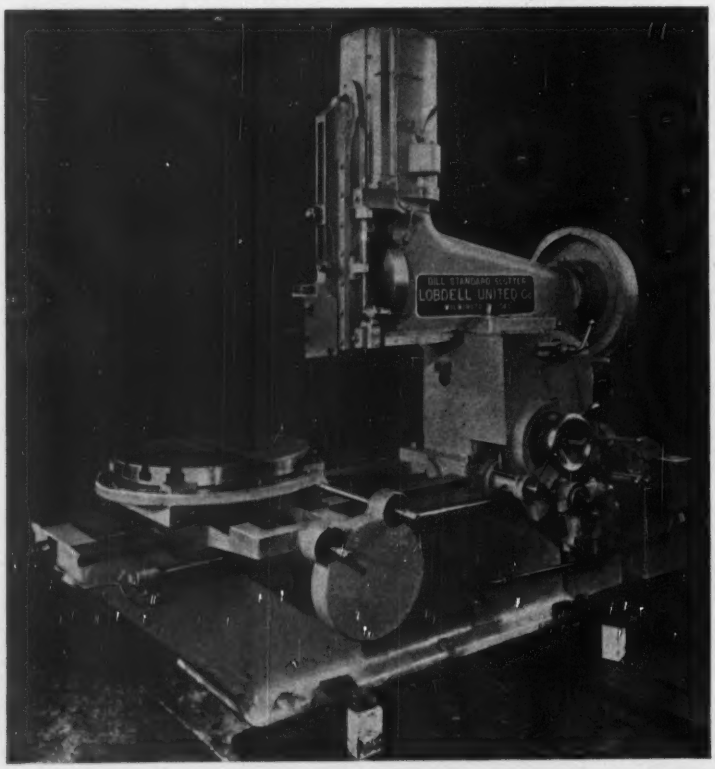
A device known as the "Micro Pin" tool setter has been developed by Arnold C. Gayne Associates, Inc., 670 State St., Bridgeport, Conn., to save time when replacing resharpened tool bits in their holders on automatic machine turrets. After a set-up is made, and a part produced within the required tolerances, the tool setter is placed on the holder where it is held in place by a permanent magnet through spring pressure, eliminating any clamping distortion. Three-point positioning legs allow for any irregularities in the tool-holder.

Gage pins are next brought into contact with the cutting edges of the tool bits and locked with set-screws. After removing the tool setter and placing it on a surface grinder, the back ends of the pins are ground flush with the face. The set-screws are then backed off and the pins are allowed to float, providing a permanent and accurate means of measuring the tool location so that the tool can be reset in exactly the same position whenever necessary.



"Micro Pin" tool setter for relocating tools in their holders

To reset a tool bit, the "Micro Pin" tool setter is placed on the tool-holder or boring-bar. The tool bits are advanced until the cutting edges contact the floating pins. Adjustment is made until the back ends of the pins are flush with the faceplate. This is done by feel on a rough cut or with a dial indicator on a finish cut. The tool bits are secured and the tool setter removed. No particular skill is required to make the settings which can easily be completed in a few minutes.



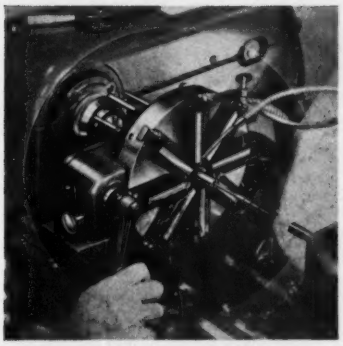
Dill slotter of improved design with completely enclosed counterweight, announced by the Lobdell United Co.

"Nu-Twist" Die Adapter for Electrode Inserts

The same die can be used for many different resistance welding operations with the "Nu-Twist" die adapter now being manufactured by P. R. Mallory & Co., Inc., 3029 E. Washington St., Indianapolis 6, Ind. A quick change of electrode inserts is all that is required to adapt the die to various operations such as spot-welding, projection welding, electrical upsetting, and electrobrazing.

The unique design of the adapter holder and electro inserts, having no threads or tapers, enables the operator to release or secure the electrode with a simple turn of the locking nut so that he can change inserts while the die base remains in the machine. A clearance space of only 1/16 inch is ample between the upper and lower electrode inserts when replacement is made.

The die adapter bases are custom designed to fit the machine specifications. "Nu-Twist" electrode inserts are available in a range of sizes to fit most welding applications, but can be specially designed.



Multiple-tool lathe attachment made by the General Roto Co.

"Roto Head" Multiple-Tool Lathe Attachment

An attachment designed to speed up production of duplicate parts on small lathes is being manufactured by the General Roto Co., 8914 Melrose Ave., Los Angeles 46, Calif. This attachment is designed to fit any engine lathe having a swing of from 9 to 12 inches.

The "Roto Head" operates on a principle similar to that of Swiss type automatic machines. It has eight different single-point tools mounted in slidable, spring-loaded tool-holders. The tool-holders are equally spaced radially around the face of a rotating head, each tool pointing toward the lathe axis. The head is mounted on the cross-slide dovetail, replacing the conventional cross-slide.

Each tool is fed inward individually by rotating a hand crank. A cam attached to the crank advances the tool to its full cutting depth by contacting either of two buttons behind the tool-slide. Each button is equipped with a micrometer adjustment. Thus it is possible for each cutting bit to turn two different diameters. As the crank continues to rotate, the head automatically indexes to the next station, the cutting cycle being repeated successively with each tool-slide.

All longitudinal feeds are made by conventional carriage travel. Stops provided for each station automatically index and limit longitudinal feeds, permitting work having a total of twenty-three shoulder lengths to be turned and cut off.

The work is supported at the tool point by three universally adjustable rollers. Rigidity of the work-support is sufficient to permit 1-inch bar stock to be reduced to zero in one pass. No center drilling of work is required and no tailstock support is needed. Work can be machined from full-length bar stock to close tolerances, held to desired concentricity, and cut off in a simple series of crank rotations and manual longitudinal cuts. Tailstock turrets and tooling can be used in conjunction with the Roto Head.

Milling Attachment for Taylor Balancing Machines

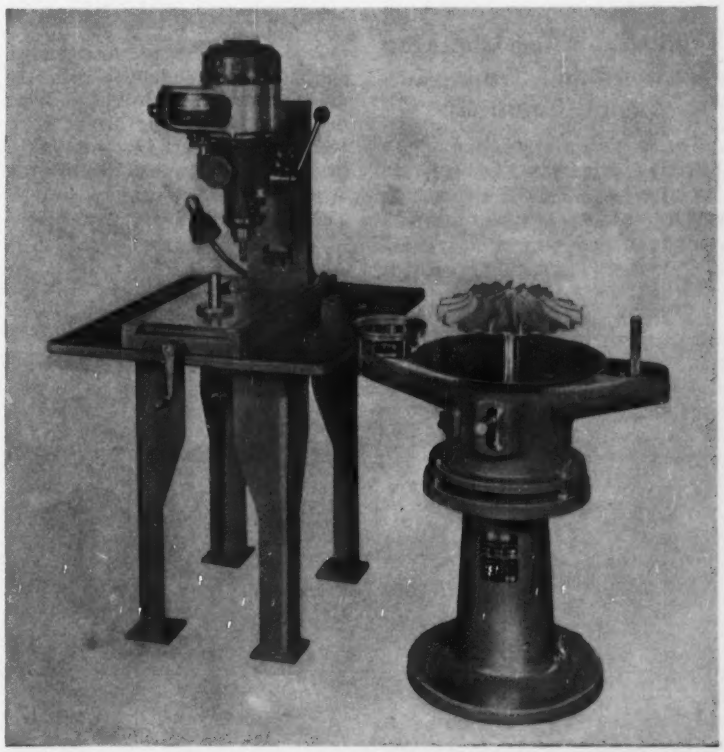
The Taylor Dynamometer & Machine Co., 528 W. Highland Ave., Milwaukee, Wis., is now producing an attachment for use with the company's "HI-EFF" static balancing machines. The attachment comprises a simplified, inexpensive unit for performing the milling operations required to bring parts into balance.

The unit was developed because of the demand for a simplified method of correction or balancing by milling where removal of weight is required and drilling is not feasible. The unit consists of a milling attachment mounted on a sturdy, ground work-table with coolant trough. The fixture for the part to be corrected is mounted on ways and moved against an end-mill in the milling attachment. A manual feed-screw with a graduated collar for accurate measurement of the amount of stock removed is provided.

Brazing, Welding, and Cutting Electrodes

A phosphor-bronze electrode for arc-brazing nickel alloys and cast and malleable iron, and for arc-welding copper, bronze, and brass has been developed by the All-State Welding Alloys Co., Inc., 249 Ferris Ave., White Plains, N. Y. The electrode—identified as No. 24 Type "C"—has a flux which is said to completely encircle each drop of metal as it leaves the electrode, and thus provides adequate protection until the drop is deposited on the base metal.

This electrode assures a deposit



Milling attachment for use with balancing machine has been announced by the Taylor Dynamometer & Machine Co.

metal in which the original analysis is closely maintained even to the tin content. It also enables complete "floating out" of slag or impurities in a form which is easily removable.

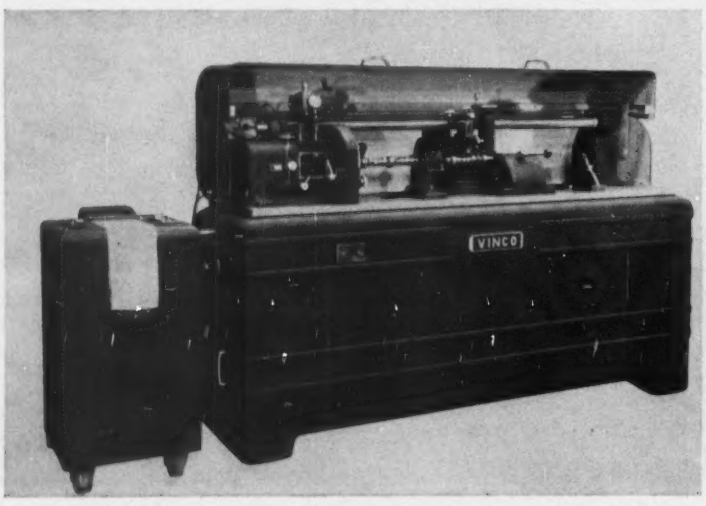
Analysis of arc deposit shows the following percentages: Copper, 91.73; tin, 7.85; silicon, 0.07; phosphorus, 0.05; iron, 0.20; and other, 0.10. Arc deposits indicate a tensile strength of 61,000 pounds per square inch, a yield strength of 34,000 pounds per square inch, an elongation in 2 inches of 42.5 per cent, and a Brinell hardness of 72. The electrodes are available in six standard sizes from 3/32 to 1/4 inch, inclusive.

A new "5-in-1" cutting electrode has also been announced by the company, which is said to cut, chamfer, bevel, pierce, and gouge up to two and one-half times faster, at the same heats, than previously available cutting electrodes. It requires no oxygen, acetylene, or other fuel gas; and is applicable to steel, stainless steel, iron, cast iron, copper alloys, nickel, and nickel alloys with either alternating or direct current. The electrode is available in sizes from 3/32 up to and including 1/4 inch.

Comparator for Checking Contour and Timing of Engine Camshafts

The Vinco Corporation, 9111 Schaefer Highway, Detroit 28, Mich., is bringing out a camshaft comparator by means of which engine camshafts are checked for accuracy of cam contours and timing against a master cam. The master cam is ground and lapped to an accuracy of 0.0001 inch. Cam contour variations are shown on a 0.0001-inch dial indicator and simultaneously recorded on a linear chart. The dial indicator readings and chart recordings are identical, and will give repeat readings within 0.0001 inch.

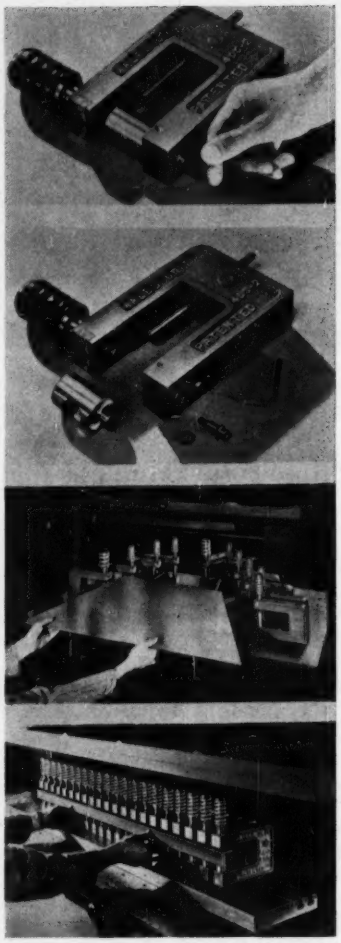
Cam-lobe and keyway timing errors are shown on a built-in vernier-equipped, graduated plate, and the timing check is accurate to within 1 minute of arc. Although the instrument is tooled for an individual camshaft, a wide range of sizes can be accommodated. The comparator has a maximum capacity between centers of 44 inches and will take camshafts with journal diameters up to 2 3/8 inches, cam base circles up to 1 5/8 inches, and cam rise from 0 to 3/8 inch. Camshafts that are similar in all respects, except cam contour, may be inspected by making minor change-overs.



Vinco comparator for checking contour and timing of camshafts

Wales Hole Punching Unit with Positive Die Retainer

A positive die retainer and a simplified interchangeable die removal method for Wales Type "CJ" hole punching units have just been announced by the Wales-Strippit Corporation, 345 Payne Ave., North Tonawanda, N. Y. This development permits the interchangeable dies to be a slip fit in the holders and to be fastened securely in place by a threaded pilot pin which can be tightened or removed with a hexagonal wrench.



(Top view) Illustrating method of moving threaded pilot pin which releases the interchangeable die from Wales-Strippit Type "CJ" holders. (Second view from top) Threaded pilot pin and die removed from hole punching unit. (Second view from bottom) Units mounted on template in a stamping press. (Bottom view) Set-up on a strip template in a press brake

Each hole punching unit consists of a holder that carries the punch, die, and stripping mechanism. This self-contained unit eliminates the necessity of attaching the punch to the press ram, and assures permanent alignment of punch and die. With these units, dies can be quickly made up and put into operation.

Set-ups are made on T-slotted plates or templates for stamping

presses, and on T-slotted plates, rails, or strip templates in press brakes. By simply placing the set-up on the press bed it is ready to start punching with the first stroke of the press without adjusting the units, punches, or dies. Due to the uniform shut height of the hole punching units, the press ram requires only one adjustment regardless of the number of hole punching patterns placed in operation.

The units are available in three holder widths with a maximum punch diameter of 3/4 inch for use in punching holes in metal up to 1/4 inch thick. The pedestal type die permits punching holes in angles as well as in sheets.

All-Plastic Welding Helmets

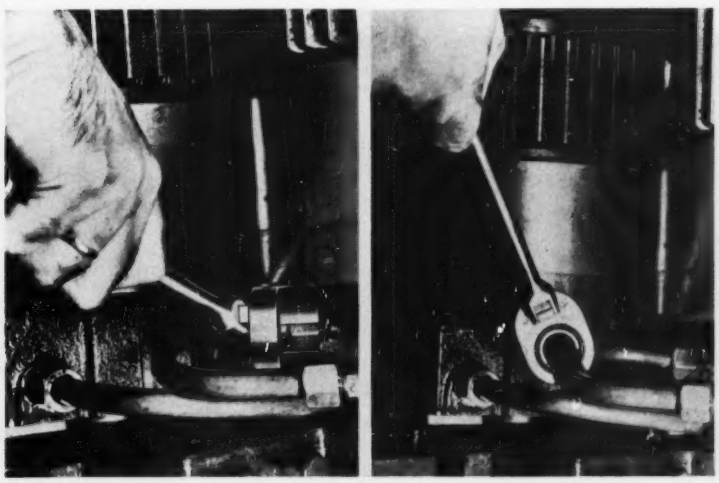
A line of one-piece compression-molded plastic welding helmets has been brought out by the American Optical Co., Southbridge, Mass. The shell of this No. 700 series helmet is made of thermosetting Fiberglas reinforced with polyester resin, which is claimed to possess many advantages. Its seamless construction makes the helmet exceptionally strong. The Fiberglas material is moisture-proof, resistant to high heat, light in weight and will not warp. Tests indicate that this material has superior wearing and performance qualities. Its smooth surface can be easily cleaned or sterilized.

Four completely insulated light-weight glass holders with exceptional impact resistance are available—plastic stationary or lift-front types and insulated steel or Dowmetal lift-front types.

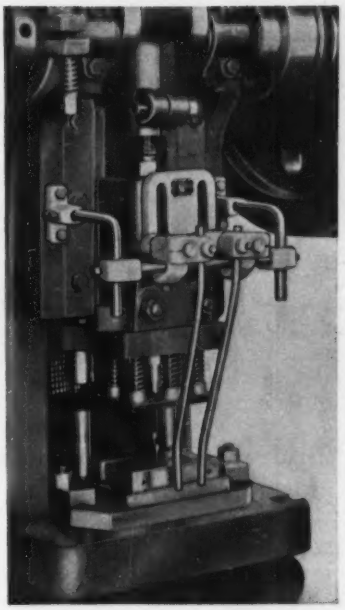
Open-End Ratchet Wrench

A ratchet socket wrench with an open end which permits it to be introduced from any side of the socket, over and completely around a pipe or tube, and moved straight down on the fitting (as shown in the illustration) is being manufactured by the Tubing Appliance Co., Inc., 10321 Anza Ave., Los Angeles 45, Calif. When applied as illustrated, the socket engages the nut or bolt and ratchets it off or on as fast as the wrench can be operated.

The wrench head ratchet action is obtained by means of internal pawls. These act upon teeth cut into an extremely strong ring which travels in a circular channel around the wrench head. As little as 7 degrees clearance for the regulation square drive handle will permit normal functioning, without the danger of bending or "chewing up" the tube or fitting, even though made of soft copper. Thin-walled sockets incorporating unusually strong steel alloys come in a range of from 3/8 inch to 4 inches in 1/16 inch increments in sixty-four sizes, making it possible to do the work of other types of wrenches. Adapters for turnbuckles, hexagonal and square drives, Phillips and Allen head screws are also available.



Ratchet wrench with open end which has been placed on the market by the Tubing Appliance Co., Inc.



Power press equipped with Cooper Weymouth safety guard

Cooper Weymouth Sweep Guard for Power Presses

A safety guard for power presses employed for forming and secondary operations has been placed on the market by Cooper Weymouth, Inc., 277 Noble Ave., Bridgeport 8, Conn. Two guard arms actuated by the press ram are given a sweeping motion which pushes the operator's hands safely away from the danger area as the ram starts to descend. The positive protection provided by this natural sweeping motion is said to increase the confidence of the operator and allow full concentration upon production.

The operators' field of vision is unobstructed by the two guard arms which may be adjusted to suit specific applications. They can be formed so as to sweep directly over the lower die or to guard the front, the back, or the side of the die.

File Kit Containing Assortment of Shapes for Power Die Filing

"Illinite" files specially designed by the Illinois Tool Works, 2501 N. Keeler Ave., Chicago 39, Ill., for use in power filing machines are now available in a handy plastic kit. The kit contains a com-

plete assortment of the twelve basic file shapes normally required in die filing work.

Features of the kit are individual pockets for each file to assure maximum protection and identification of each file by name and by profile section. All files are "00" cut with 3/8-inch shanks. They are 5 5/8 inches in over-all length, and have a filing or cutting length of 4 inches. The files are made extra heavy to withstand cutting pressure, and are made from forged rounds for accurate alignment of file body and shank.

"Bridge Grinder" Designed for Precision Surfacing

The Southwest Machine Works, 1309 Bridge Blvd., S.W., Albuquerque, N. M., is manufacturing a new type metal surfacer designed to enable an unskilled operator to grind extremely accurate flat and square surfaces by hand, without the use of expensive fixtures. This machine, called the "Bridge Grinder," has a 5-inch cup-wheel mounted directly on the end of the motor shaft. The cup-wheel is adjusted to extend slightly beyond the surface of a stationary fence along which the work is moved and guided by hand. Since the center or inner section of the fence within the rim of the cup-wheel is on the same plane as the outer sections, a true flat surface is produced.

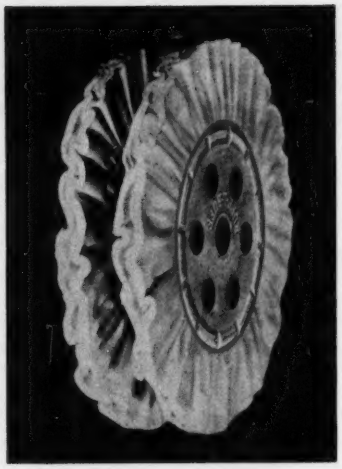
Blanking dies, straightedges, straight cutter blades, aircraft castings, and automotive parts are typical examples of precision surface grinding work which can be economically handled on the "Bridge Grinder." The table is 18 inches long, 4 1/2 inches wide, and has a vertical fence with a grinding surface which is 3 1/4 inches high.

A 1/3-H.P., continuous, heavy-duty ball-bearing, totally enclosed motor, operating at a speed of 3450 R.P.M. on 115-volt single-phase current, drives the standard Type 6 straight cup-wheel.

Electronic Micrometer

A Model W electronic micrometer to permit measuring to an accuracy of 0.00002 inch without exerting any measuring pressure on the work has been developed by the J. W. Dice Co., 1 Engle St., Englewood, N. J. This instrument is not a comparator and is designed to make all measurements directly. It has a measuring head with an extremely accurate micrometer screw. An electronic circuit, sensitive to 0.000005 inch displacement at the micrometer tip, gives a visual indicaton at the moment of contact but before pressure is exerted.

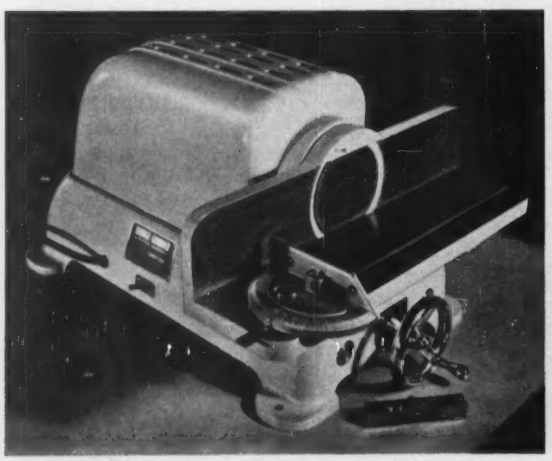
This electronic micrometer is intended for use in research, development, and performance testing of diaphragms and bellows used in flight instruments, and temperature, refrigerator, and other types of controls where a pressureless means of testing is required. It can also be used for measuring thin paper, fine wire, foil, machined parts, springs, etc.



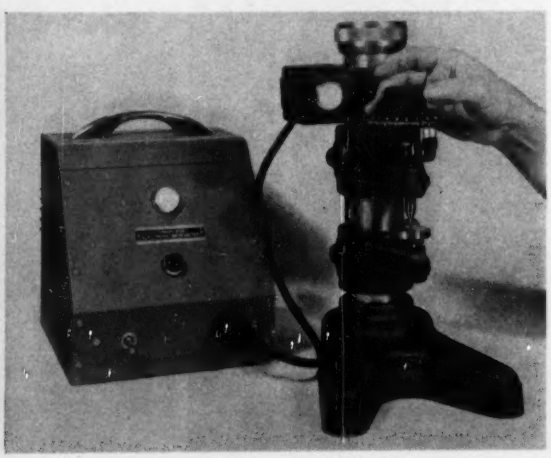
Ventilated buff announced by the Hanson-Van Winkle-Munning Co.

Hanson-Van Winkle-Munning Ventilated Buff

The Hanson-Van Winkle-Munning Co., Matawan, N. J., has announced a self-ventilating buff designed to enable faster buffing and reduce buff wear. Known as "Ruff-L-Buff," it may be used for hand or machine operation. When two or more of these buffs are combined to make up a buffing wheel, ventilating air enters the wheel through holes in the fiberboard centers of the buffs. As the wheel rotates, centrifugal force drives the air through twelve channels between each buff to the cloth portions of the buff, where numerous ruffles distribute the air over the buff side and channel it on through the wheel, cooling



Grinder for precision surfacing by hand built by Southwest Machine Works



Electronic micrometer which was recently brought out by the J. W. Dice Co.

as it goes. This ventilating feature results in conserving buffing composition, the binding element of which is not volatilized by excessive heating. The "Ruff-L-Buffs" are available in standard and heavy-duty weights with outside diameters of 12, 14, 16, and 18 inches.

Labelon Adhesive Tape with Drafting Symbols

Large savings in drafting time are said to be made possible through the use of pre-printed adhesive tape introduced by the Labelon Tape Co., Inc., 450 Atlantic Ave., Rochester 9, N. Y. This new tape has many advantages. Not only is the tedious initial drawing of repetitive symbols eliminated, but changes in temporary lay-outs can be made instantly by simply stripping the tape from its original position and placing it wherever desired. No redrawing or erasing is ever necessary. Since the tape is "pressure sensitive," it sticks without moistening and can be stripped off repeatedly without leaving a mark or losing its adhesive quality.

All standard symbols for walls, aisles, conveyors, monorails, columns, colored arrows for material and process flow, etc., are available in either 324- or 648-inch rolls to a scale of 1/4 inch to 1 foot, in opaque or transparent types. The opaque types are used for photo-copying, and the transparent types for reproduction on ammonia vapor machines.

Alfing Boring Machine Built to Handle Jet-Engine Compressor Case

A machine built for the complete processing of a jet-engine compressor case by the Alfing Kessler Werke, Germany, is being introduced in this country by the Morey Machinery Co., Inc., 410 Broome Street, New York 13, N. Y. The boring-bar of this machine is of rigid design and has a temporary support for use during loading. It is made to permit considerable adjustment for design changes.

The tool-slides are mechanically actuated and hydraulically con-

Specially designed machine for processing jet-engine case introduced by Morey Machinery Co.

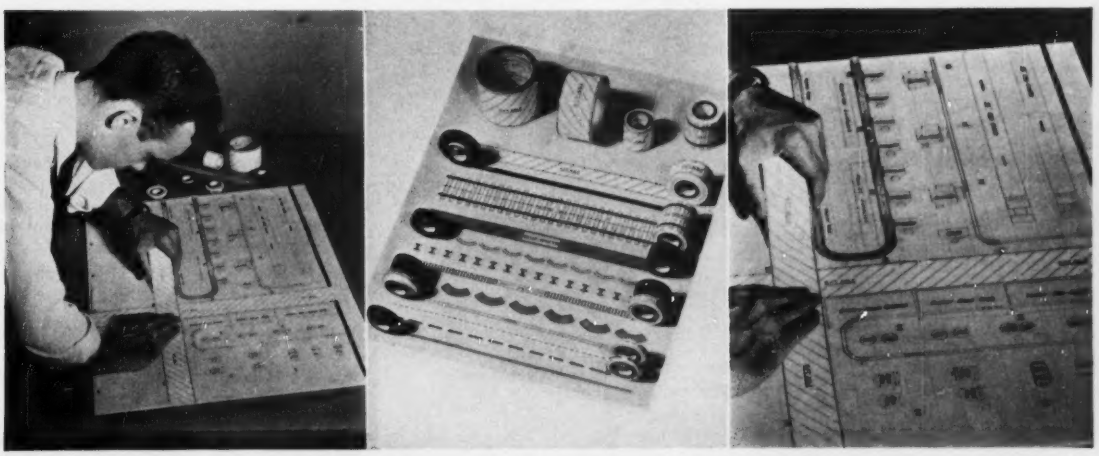
trolled. Both halves of the compressor case housing are clamped in the fixture by a series of self-locking, spring-loaded blocks, after which the carriage advances the work over the boring-bar. The boring-bar is inserted in an outboard support bearing and the temporary support is retracted. Cylindrical, tapered, or combined bores, end faces, T-slots, and other grooves can be machined.

Centerless grinder for small work in tool-room and job shop made by the Royal Master Metal Products Co.

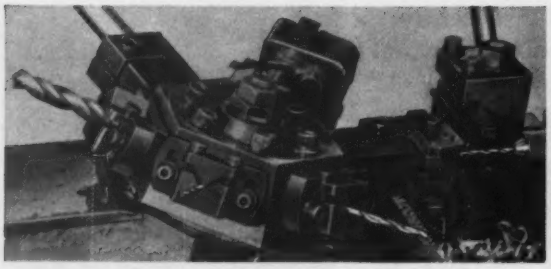
Centerless Grinder for Straight or Contour Small-Diameter Work

A centerless grinder designated TG-123, for handling straight or contour work from 1/16 to 1 inch in diameter, is being manufactured by the Royal Master Metal Products Co., State Highway 23, Riverdale, N. J. Work ground on this machine, it is claimed, can be consistently held to tolerances as fine as 0.0003 inch. It requires a floor space of only 23 by 36 inches, exclusive of the coolant tank, and the driving power is provided by a 3-H.P. motor.

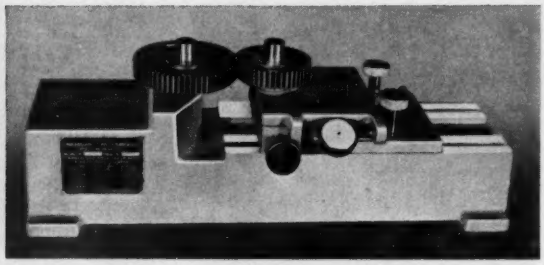
A range of 30 to 480 R.P.M. for the regulating wheel-spindle is provided by an infinitely variable-speed gearless drive, which elim-



(Left) Making lay-out with Labelon tape; (center) pre-printed Labelon adhesive tape; and (right) close-up view of lay-out made with pre-printed adhesive tape



Lathe turret equipped with V-jaw adjustable tool-holders manufactured by Brookfield, Inc.



Rolling fixture for checking external spur and helical gears brought out by Michigan Tool Co.

inates the possibility of producing a gear tooth pattern on the work. The regulating wheel is mounted between ball bearings, and the grinding wheel spindle is mounted in preloaded, permanently lubricated, precision ball bearings.

A large dial facilitates making size settings to 0.0001 inch. The manual in-feed lever is easy to operate. Standard equipment includes manual wheel dressers of the contour forming type. The coolant tank is a completely separate unit mounted on large casters, which facilitates thorough cleaning and permits the tank to be moved anywhere in the shop for use wherever an emergency coolant unit is required.

Brookfield Adjustable V-Jaw Tool-Holder

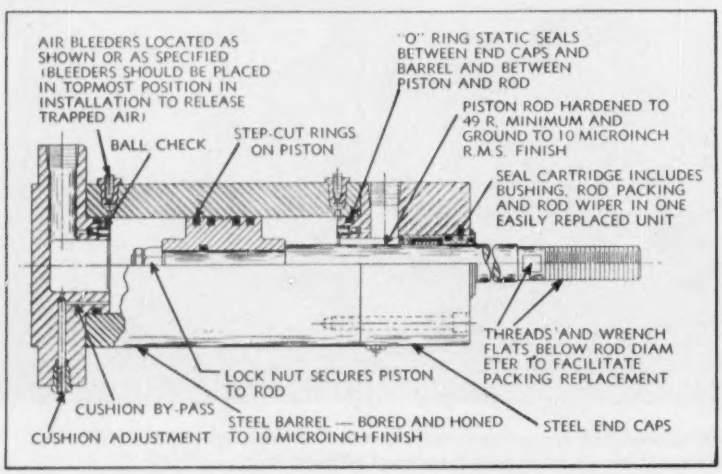
Brookfield, Inc., 755 Boylston St., Boston 16, Mass., has announced the addition of two models to its line of adjustable V-jaw tool-holders. The new Model DB holder has radically reduced body dimensions as compared with the original DA model, yet it will hold any tool from 1/64 to 1/2 inch in diameter. The new Model GA holder has sufficiently increased body dimensions to make possible the holding of any size tool from 1/16 to 3/4 inch in diameter. As with the original model, precision grinding of all working surfaces insures that the tool-holder shank and V-jaw section are permanently parallel within 0.0005 inch in 6 inches. Run-out is actually less than 0.0001 inch per inch.

In use, it is only necessary to insert a tool in the axially true jaw section of the holder and tighten the jaw screws. Dead center adjustment can then be made by floating the tool into position in the normal way and tightening the locking screws of the unit. The spherical under sides of the heads of the locking screws and the internally beveled washers into which the heads fit provide a balanced pressure locking assembly, which maintains uniform seating and eliminates all possibility of creep or shift during tightening.

Bench Type Fixture for Checking Gears

A Model 602 bench type rolling fixture for checking size, eccentricity, and smoothness of the rolling action of spur and helical external gears is announced by the Michigan Tool Co., 7171 E. McNichols Road, Detroit 12, Mich. The fixture features a heavy cast-iron base, scraped ways, and hardened and ground ball ways.

The gear to be checked is loaded on a vertical arbor that is moved into mesh with the master gear by an eccentric lever control. Proper tension between gear and master gear is maintained by spring-loaded ball ways. Turning the gear manually causes a 0.0005-inch indicator to show size, eccentricity, and smoothness variations. The fixture has a center distance adjustment of from 2 to 10 inches. The master gear arbor has an outside diameter of 1 inch. Arbors for gears to be checked are made to suit. The fixture is 9 1/2 inches wide, 29 inches long, and 7 1/4 inches high.


AIR BLEEDERS LOCATED AS SHOWN OR AS SPECIFIED (BLEEDERS SHOULD BE PLACED IN TOPMOST POSITION IN INSTALLATION TO RELEASE TRAPPED AIR)
"O" RING STATIC SEALS BETWEEN END CAPS AND BARREL AND BETWEEN PISTON AND ROD
PISTON ROD HARDENED TO 49 R. MINIMUM AND GROUND TO 10 MICROINCH R.M.S. FINISH
BALL CHECK
STEP-CUT RINGS ON PISTON
SEAL CARTRIDGE INCLUDES BUSHING, ROD PACKING AND ROD WIPER IN ONE EASILY REPLACED UNIT
THREADS AND WRENCH FLATS BELOW ROD DIAMETER TO FACILITATE PACKING REPLACEMENT
LOCK NUT SECURES PISTON TO ROD
CUSHION BY-PASS
CUSHION ADJUSTMENT
STEEL BARREL — BORED AND HONED TO 10 MICROINCH FINISH
STEEL END CAPS

Hydro-Line Cylinders for High-Pressure Oil or Water Service

Diagram illustrating design and operation of one of a new line of hydraulic cylinders for working pressures up to 2000 pounds per square inch (3000 pounds per square inch in non-shock service). Announced by the Hydro-Line Mfg. Co., 19th St., Rockford, Ill. Identified as Series "J" cylinders, these units feature all-steel bodies, bored barrels, hardened piston-rods, rod scrapers, and new cartridge type packings, and comply with J. I. C. specifications. Cushion adjustments as shown in the diagram are optional. These cylinders are regularly available for oil or water hydraulic service in bore size diameters up to 10 inches.

Presenting a

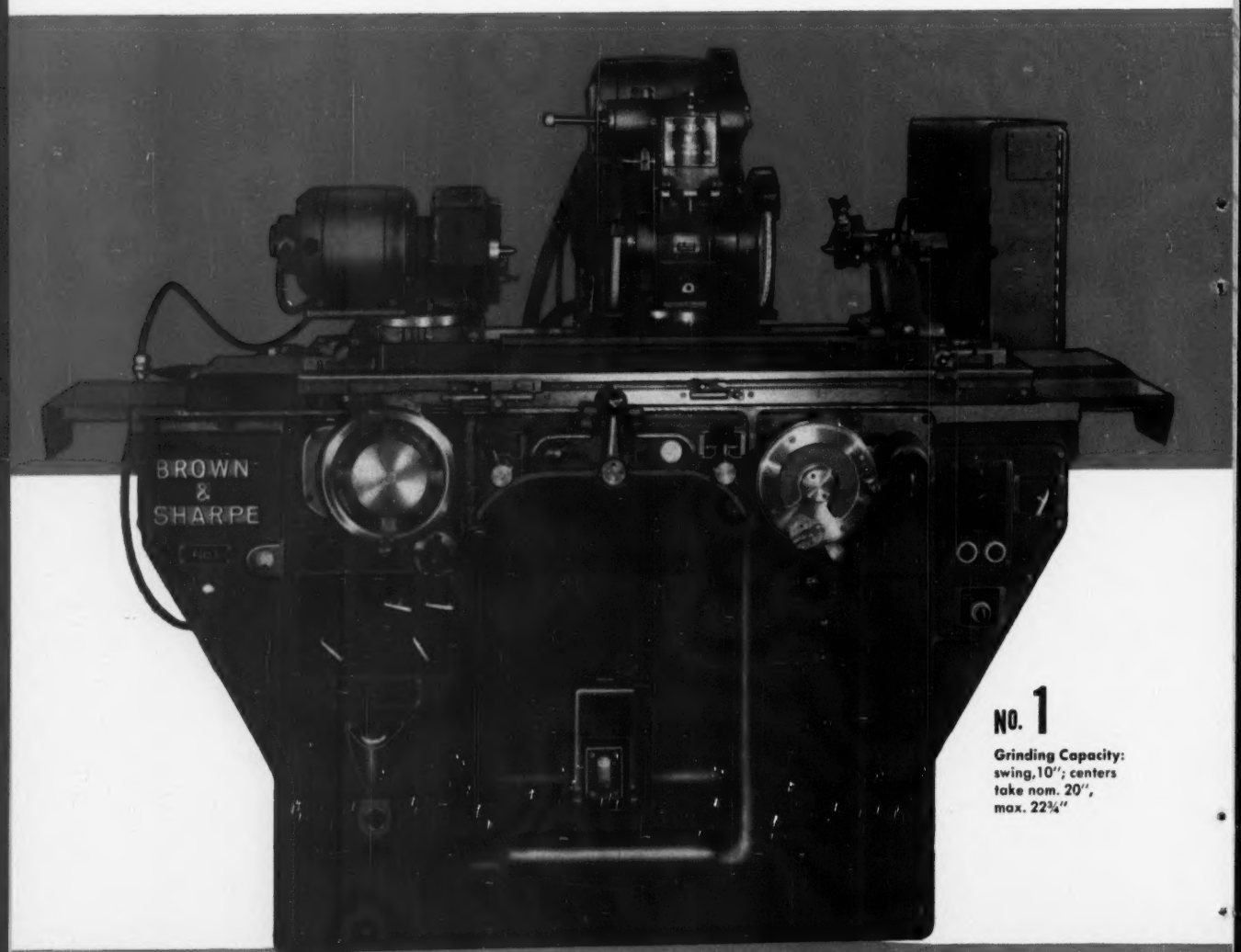
COMPLETELY NEW LINE

of Universal Grinding Machines

Brown & Sharpe

BS

4 Completely New...

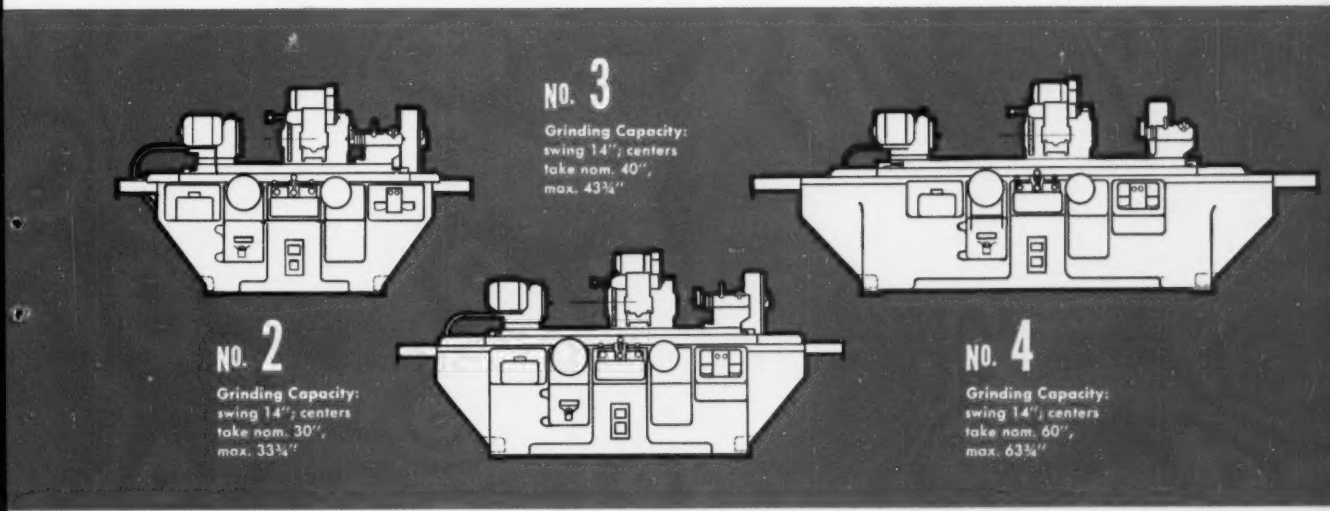


No. 1

Grinding Capacity: swing, 10"; centers take nom. 20", max. 22¾"

Universal Grinding Machines

Productioneered to handle the widest variety of precision work at production speeds

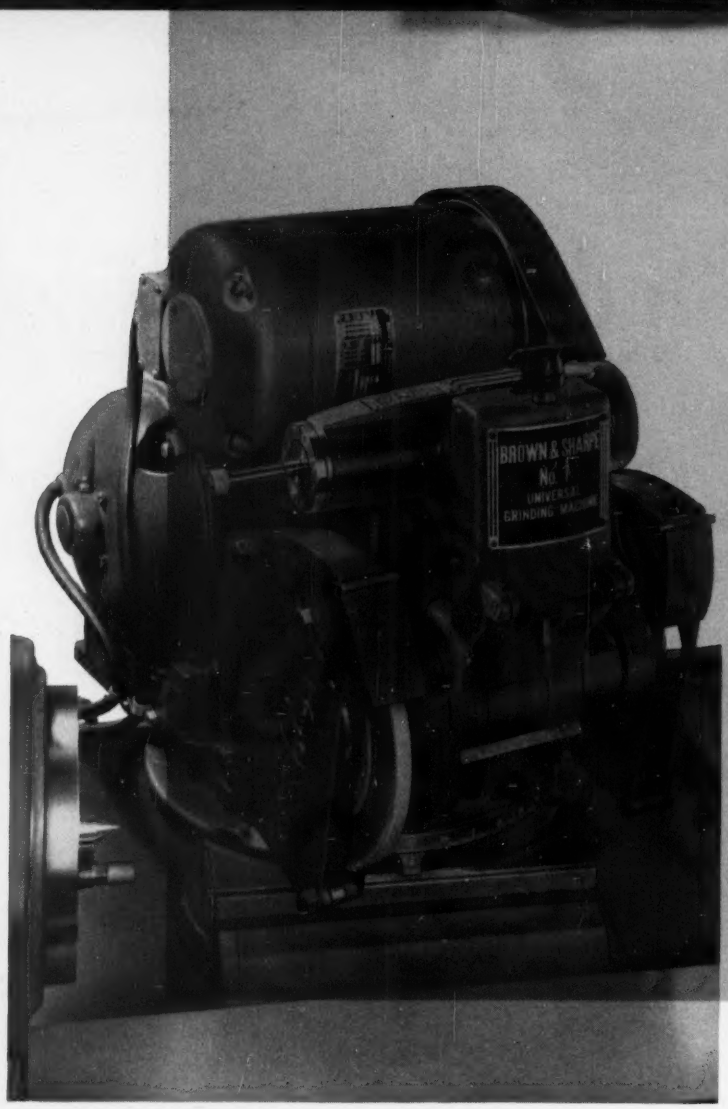


This entirely new line of Brown & Sharpe Universal Grinding Machines bridges the long-existing gap between conventional universal and single-purpose grinding machines. Years of extensive research and development . . . the combined talents of Brown & Sharpe engineers and craftsmen . . . have been employed to bring you this ultra-modern group of new Universal Grinding Machines. Their many new and exclusive features provide exceptional grinding flexibility, rigidity, and accuracy. Instant combining of operating functions into automatic cycles extends the usefulness of this equipment beyond the toolroom and job shop, to many production applications.

Compare these new Brown & Sharpe Universal Grinding Machines feature for feature . . . see the following page.

Brown & Sharpe B·S

Compare all these *productioneered* features



- **Completely Universal Wheel Spindle Unit**

  Design of wheel spindle unit permits either the external grinding spindle or the internal grinding spindle to be used in any desired horizontal position. Accurate compound settings can be made for combination straight and taper, or double taper grinding (both external and internal) with only one set-up.

- Removable Unit Type External Grinding Spindle
- Greater Flexibility of Grinding Speeds
- Instantly Available Internal Grinding Spindle, Independently Driven
- Hydraulic Table Drive Maintains Smooth, Constant Table Movement
- Variable Speed Headstock
- Table Throttle Permits Exact Repetition of Truing and Grinding Speeds
- Unique Universal Turret Provides Extra Work Capacity
- Faster, More Accurate Sizing
- Positive Stop on Cross Feed for Both External and Internal Grinding
- Built to Meet J.I.C. Electrical and Hydraulic Standards
- Additional Automatic Functions Available to Increase Productive Flexibility

Get complete specifications on these new ultra-modern Universal Grinding Machines and their diversified equipment — write for illustrated Bulletins.

Brown & Sharpe

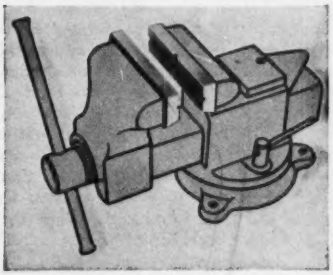
Milling Machines • Grinding Machines • Screw Machines • Cutters • Machine Tool Accessories
Machinists' Tools • Electronic Measuring Equipment • Johansson Gage Blocks • Permanent Magnet Chucks • Pumps

BROWN & SHARPE MFG. CO., PROVIDENCE 1, R. I., U.S.A.

PRINTED IN U.S.A.

Soft Jaws for Vise Provided with Permanent Magnets

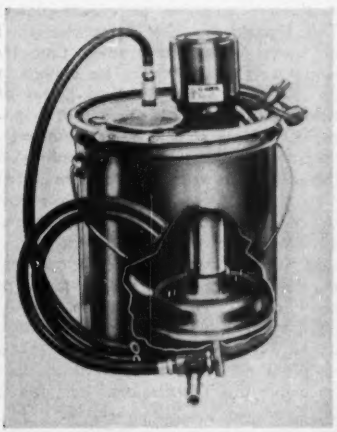
Soft jaws for vises introduced by Magne-Grip Tool Co., 4900 W. Madison St., Chicago 44, Ill. These soft jaws utilize built-in permanent magnets, which enable them to be snapped into position quickly and easily. The magnets hold the jaws securely yet permit them to be easily removed. The jaws are designed for use in factories, shops, and

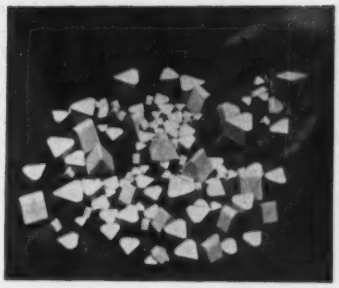


tool-rooms. A two-way V groove locks the work in, holding it in any position desired, regardless of size or shape. The soft jaws are made of an alloy that will not mar or scratch delicate finishes or highly polished metals.

Bantam Coolant Tank and Pump Unit

Self-contained coolant pump system developed by the Samuel S. Gelber Co., 162 N. Clinton St., Chicago 6, Ill. This low-cost unit is designed especially for economical operation. The all-bronze centrifugal pump unit is precision built for long-lasting, trouble-free performance. Quick, easy flow control valve gives instant adjustment from 0 to 400 gallons per minute. The totally enclosed 1/30-H.P., continuous duty, fan-cooled motor operates at 1500 R.P.M. The unit is easily regulated to individual requirements of drill presses, lathes, tappers, cut-off saws, grinders, belt sanders and milling machines.





Finishing and Deburring Chips for Use in Tumbling Barrels

"Crown Pebs," a newly developed tumbling medium for barrel tumbling, deburring, and finishing introduced by the Crown Rheostat & Supply Co., 3465 N. Kimball Ave., Chicago, Ill. These "Pebs," are made of a tough white ceramic. They are of uniform size, triangular in shape and do not lodge in holes or slots in the work.

Benchmaster Belt Sander

Belt sander designed for fine burring, grinding, and polishing operations on metals, rubber, plastics, glass, and similar materials. The belt wheels are 4 inches in diameter, and are mounted on heavy duty, double-row double-sealed ball bearings. A new design of trackage adjustment insures positive wheel alignment. The top wheel supporting arm is rocker-mounted as well as pivoted for belt take-up. A spring load insures correct belt tension when using the back-up plate. The sander requires only a 1/4-H.P., 1750-R.P.M. motor, and is driven with a V-belt. It is designed to operate at any speed up to 8000 surface feet per minute. Made by Benchmaster Mfg. Co., Gardena, Calif.

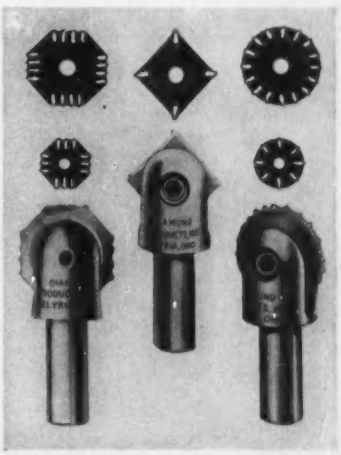
Pneumatic Air Drill

Improved type of pneumatic drill unit called the "DeKay" now being offered by the Burklyn Co., 3429 Glendale Blvd., Los Angeles 39, Calif. A self-aligned replaceable motor cartridge is incorporated in the construction of this new drill which is designed to give peak performance with minimum air consumption. The drill uses only 12 cubic feet of air per minute under full load,

and delivers 21 foot-ounces of torque. Improved features include speed regulator throttle, directional exhaust deflector, built-in silencer, and safety chuck guard. Speed of disassembly, cartridge replacement, and easy maintenance are also outstanding features. Trigger-button or lever throttle models are available in pistol-grip, straight, and right-angle extension drill types of 1/4 inch capacity, with speeds of 2200 to 15,000 R.P.M., and an 18,000 R.P.M. precision grinder with collet chuck.

Prestalloy Profile Diamond Dresser

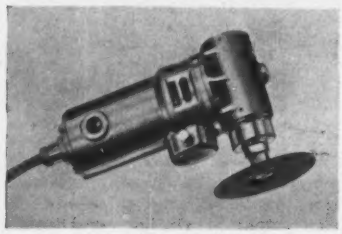
Diamond profile dresser of a line manufactured by Diamond Products, Inc., 331 Prospect St., Elyria, Ohio, that includes round, square, and octagonal shapes. These dressers are adaptable to straight, form, and profile dressing



on centerless, cylindrical, surface, and internal grinders. They can be used in either a vertical or horizontal position. The elongated West African diamonds mounted in the Prestalloy matrix of these dressers can be entirely used up so that no further setting is required.

"Diskette" Portable High-Speed Hand Tool

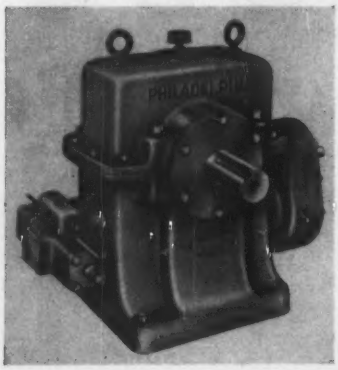
Improved "Diskette" portable electric hand tool for high-speed grinding, deburring, filing, sharpening, sanding, polishing, and other finishing jobs. Ball bearings especially adapted for high-speed operation and improved air cooling system permit this tool to be used for extended periods on precision or

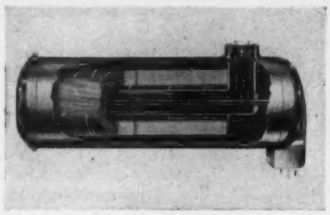


production work without fear of overheating. A universal motor for 110-120 volts alterating or direct current gives the spindle shaft a "no load" speed of approximately 9000 R.P.M. A collet chuck in the spindle accommodates all attachments, including a 4-inch sanding disc, with a minimum of overhang. Product of Franklin Balmar Corporation, Woodberry, Baltimore 11, Md.

Philadelphia Speed Reducer with Overload Protection

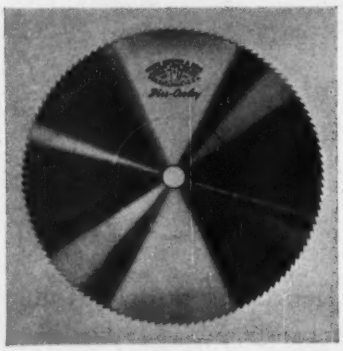
Worm-gear speed reducer with an automatic and instantaneous shut-off device for overload protection brought out by Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia 34, Pa. This safety feature, known as a double torque control, eliminates the need for a shear-pin coupling. When a predetermined load limit is reached, motor current is immediately cut off by direct mechanical action of the overload. To restart operation, only removal of excessive load is necessary. No resetting or replacement of parts is necessary. Available in a wide range of horsepowers and in ratios from 3 5/8 to 1 up to 6300 to 1.





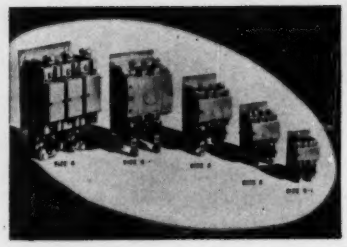
"Micronic" Filter for Hydraulic Systems

Filter especially designed for hydraulic systems, now in production by the Rucker Mfg. Co., 4516 Hollis St., Oakland 8, Calif. This unit is intended for mounting within the oil tank or reservoir, with the removable head exposed. A built-in shut-off valve permits filter replacement without draining the tank. Standard replacement filters are used. The unit may also be mounted externally. Operating features include high flow rate with minimum pressure drop. The unit is 25 1/2 inches long and 8 inches in diameter. Inlet and outlet connections are for 2-inch pipe.



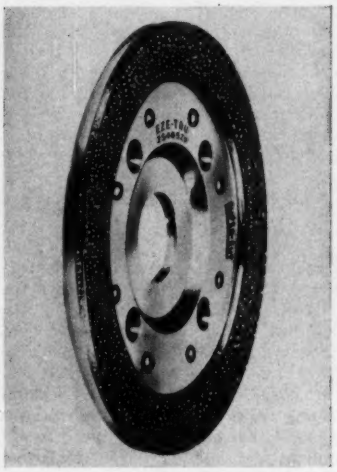
"Diss-Croloy" Circular Saw

"Diss-Croloy" circular saw is being introduced by Henry Disston & Sons, Inc., Philadelphia 35, Pa. This saw is specially designed for cutting non-ferrous metals (such as copper, brass, aluminum, magnesium, and bronze) or plastics (such as Formica, Masonite, Lucite, Plexiglas, and Micarta). The saw blade is precision made from high-carbon, high-chromium steel which has exceptionally good edge-holding qualities. Available in five diameters from 6 to 14 inches.



Magnetic Motor Starter

Magnetic motor starter designated as the "RA-V" has been added to the line of "RA" (Right Angle) motor controls manufactured by the Arrow-Hart & Hegeman Electric Co., 103 Hawthorn St., Hartford 6, Conn. This starter is designed especially to be used with the new Crouse-Hinds M52, Type EPC Condulet. It is said to meet the need for motor starters of reduced weight and size without sacrifice of performance.



"Eze-Tru" Diamond Wheels

Cup type diamond wheel with patented "Eze-Tru" feature for use on machines that have spindles with back-plates. This feature provides an easy method of truing wheels, and saves time by eliminating the necessity for shimming up low spots when the back-plates of the machine spindles are out of alignment. Truing is accomplished by means of auxiliary tapped openings in the diamond wheels which are fitted with small screws. By selectively tensioning these screws against the back-plate of the machine, the diamond cutting surface can be quickly and accurately brought into a true plane at right angles to the rotation of the spindle. This feature can be supplied on 6-, 7-, and 10-inch diameter shallow or plain cup type wheels. Introduced by Super-Cut Distributors, Inc., 3418 N. Knox Ave., Chicago 41, Ill.

Write for this NEW and Comprehensive 72-page PRESS BRAKE catalog

- Applications of Press Brakes
- The Cincinnati Line of Accurate Press Brakes
- Cincinnati Standard Features
- Important Fundamentals in selecting a Press Brake
- Specifications and Dimensions of Cincinnati Press Brakes
- Filler Blocks or Die Holders
- Special Features
- Punching Equipment and Dies

The latest features and developments in the extensive line of Cincinnati Press Brakes are thoroughly covered in this new catalog.

Many varied operations in industry are illustrated. They may suggest applications that bring new economies and increase production in your plant, as they have in many plants throughout the country.

On your request, we will promptly mail to you, the new Press Brake Catalog B-4-F

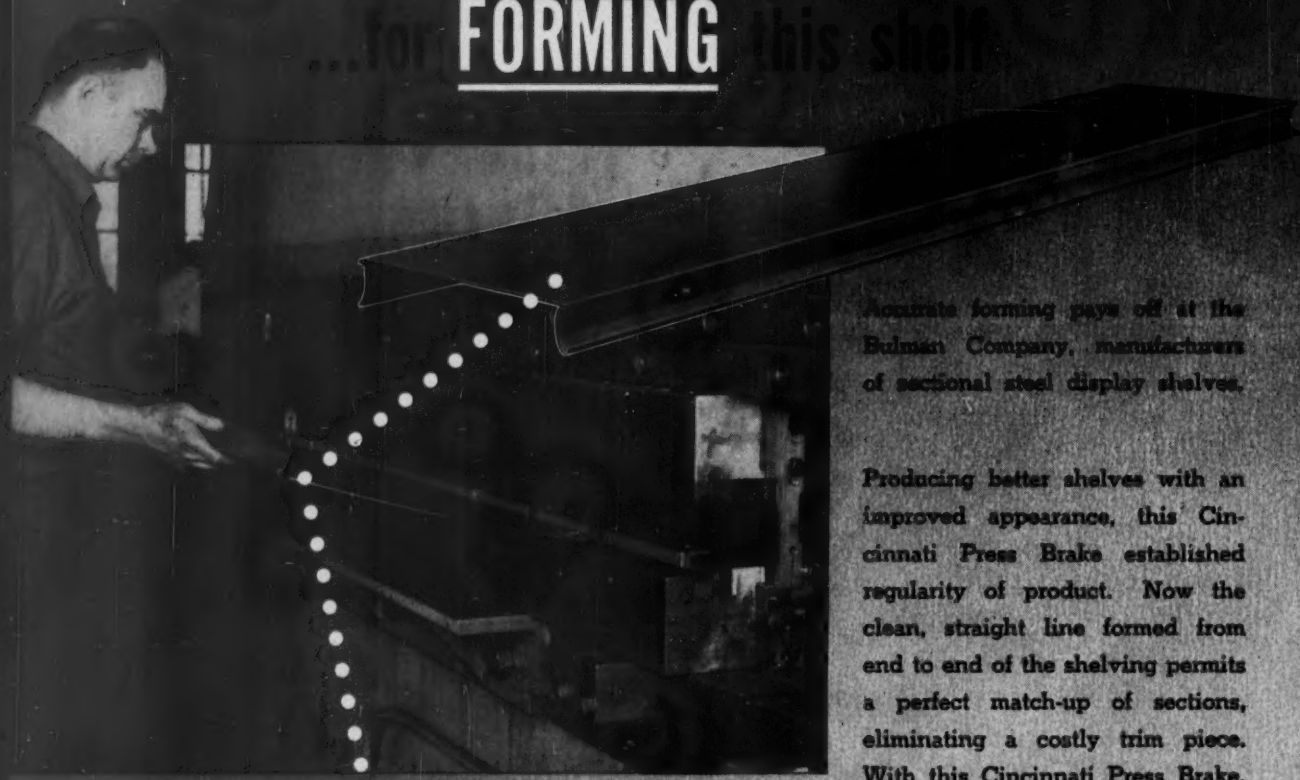
CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

Outstanding ACCURACY

...for FORMING this shelf



Note the clean, straight lines of the moldings formed on the shelf by this Cincinnati Press Brake.

These outstanding sectional Bulman display shelves fit accurately. Press Operator: C. O. Bulman Mfg. Co., Inc., Grand Rapids 2, Michigan

Accurate forming pays off at the Bulman Company, manufacturers of sectional steel display shelves.

Producing better shelves with an improved appearance, this Cincinnati Press Brake established regularity of product. Now the clean, straight line formed from end to end of the shelving permits a perfect match-up of sections, eliminating a costly trim piece. With this Cincinnati Press Brake, discards are eliminated, assembly is accurate—production time cut—and the product improved. Investigate—you may cut costs and improve products in your plant with a Cincinnati All-Steel Press Brake.

Write for our NEW 72 page Press Brake Catalog B-4.

...is necessary...

Photo Courtesy The F. H. Lawson Company

...for SHEARING

400 blanks an hour to ±.005"

All along the line this accurate blank saves money!

At 400 an hour, accurate steel blanks, 24¼" x 28⅛", are produced in lots of 10,000 from 26 gauge stock sheets.

Costs are low because of the accurate performance, rapid gauging, ease of control and safety features of Cincinnati All-Steel Shears. One and one-half to two million cuts are made before knives need regrinding—an important factor in the low cost.

The shear is so accurate that all along the production line rejects are very low. Gauging for forming and bending operations is simple and rapid, assembly is smooth, time and money are saved, and a high quality of product is maintained.

Write for your Shear Catalog S-5. Consult our Engineering Department on your shearing problems.

These accurate blanks are held to tolerances of ±.005" on Cincinnati Shears in the shops of The F. H. Lawson Company, manufacturers of sanitation, pails and all sorts of containers.

THE CINCINNATI SHAPER CO.

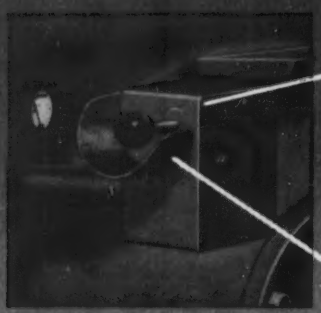
CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

CINCINNATI

Outstanding ACCURACY

...and INSTANTANEOUS CONTROL

effect a 30% saving!



The time required to shape 7 separate internal oil grooves in these steel sleeves was reduced from 1¼ minutes to 6 minutes, due to the Cincinnati Electro-Magnetic Clutch and Brake.

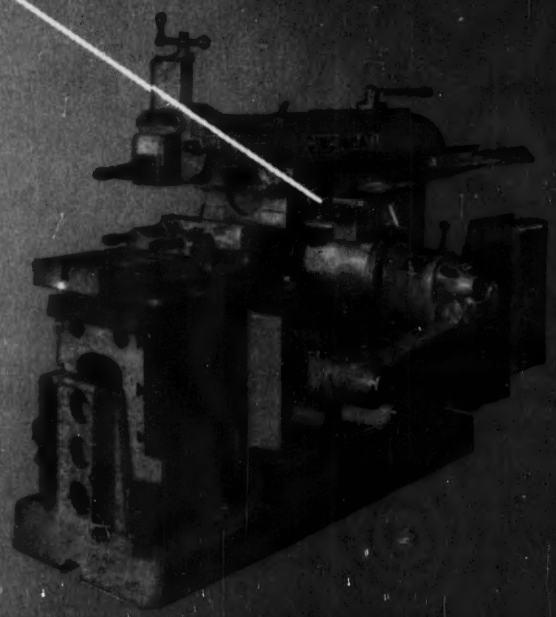
NEW CINCINNATI ELECTRO-MAGNETIC CLUTCH AND BRAKE. . . .

Where starts and stops are numerous they become a serious time waster!

The New Cincinnati Magnetic Clutch and Brake, with its single, convenient control lever, converts waste time into productive time. It gives the operator the fastest, simplest and most accurate control of his Shaper.

This powerful clutch and brake requires no shutdown for adjustment, and has a long, maintenance-free life, both time-saving and profitable features.

Write for Catalog M-5 for the complete line.



CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

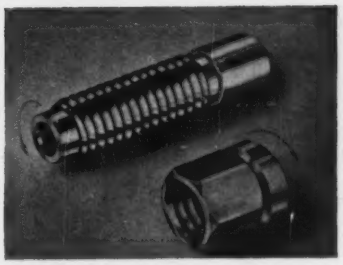
Non-Rusting Granite Surface Plates

Surface plate made from a very dense, extremely hard, and uniform-grained black granite now available through Lawley Granite Surface Plate Co., 1412 Packard Bldg., Philadelphia 2, Pa. The surface of this plate is guaranteed to be accurate within 0.00005 inch. The

plate is made to permit extremely precise measurements in quality control, manufacturing and inspection, and will not rust or warp, regardless of temperature changes or shock. In addition, it resists abrasion and impact. This plate weighs 190 pounds per cubic foot, and is available with two or four lips and in standard sizes from 12 by 18 by 4 inches up to 24 by 36 by 6 inches.

Hexagon- and Socket-Head Screws with Swivel-Shoes

Low-cost hexagon- and socket-head screws with swivel-shoes recently developed by Allied Air Parts, 66 N. Robertson Blvd., Los Angeles 46, Calif. Extremely simple to apply, these screws are adaptable for use on any type of tool, jig, or fixture, and provide positive holding without marring, scratching, or burring the part held. All parts



of the swivel-shoe set are carefully machined to insure concentricity of shoe and pitch diameter of screw.

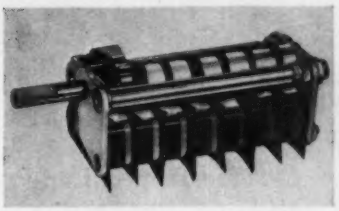
Snap Gages for Inspection and Production Checking

Snap gages developed to provide a quick method of close tolerance checking where rigid standards are maintained. They are adjustable to close

limits, and enable the operator to easily determine if parts are being produced in accordance with the specified limits. These gages come in a variety of sizes and also with special anvils. Products of H v H Tool & Instrument Co., 150 Lafayette St., New York 13, N. Y.

Micro Switch Assembly Units

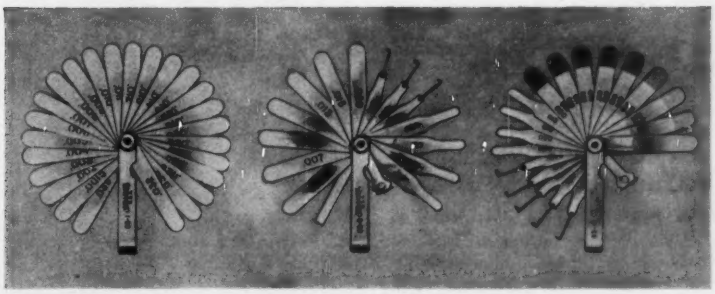
New series of small size multiple rotary switch assemblies, designed especially for aircraft use but adaptable to a wide variety of either alternating- or direct-current switching applications. Announced by Micro, Freeport, Ill., a division of Minneapolis-Honeywell Regu-



lator Co. One of the most popular of the series is a ganged assembly of seven Micro "V3" type basic switches with single-pole, double-throw contact arrangement. Each switch measures only 13/32 by 5/8 by 1 3/32 inches, and the entire assembly measures 1 1/2 by 1 5/8 by 4 3/4 inches. The detent mechanisms provide a positive feel of each position. Cam combinations can be used to give any desired sequence of circuit control or switching arrangement. The alternating-cu rent rating for inductive and heater load is 125 or 250 volts, 10 amperes.

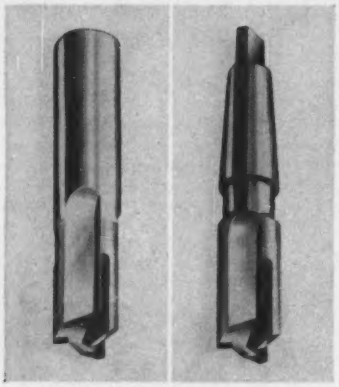
Williams Expanded Line of Feeler Gages

Feeler gages of recently expanded line manufactured by J. H. Will ams & Co., 400 Vulcan St., Buffalo 7, N. Y. The most recent additions to this line include an assortment of twenty-seven sizes of feeler gage blades, ten feeler gage sets, and a feeler gage dispenser. All blades are made from selected Swedish steel, and are properly tempered. Each blade is .lectro-etched with its decimal size and is treated with rust-resistant oil. Individual blades from 0.0015 to 0.040 inch are packaged six to an envelope and are available in 3 1/2- and 12-inch lengths. Sets have knurled lock-nuts which allow the user to select the required blade size and then lock it in position.



File Developed for Precision Work

One of a set of eighteen graded files, micrometer checked to thickness tolerances as low as 0.0004 inch to enable greater precision to be obtained by hand filing. Made by Tacony File & Hardware Co., 2814 N. 4th St., Philadelphia 32, Pa. The files have no taper in width or thickness, and range from 0.072 down to 0.009 inch. Manufacture of these files is closely controlled by micrometer checks at nine points.

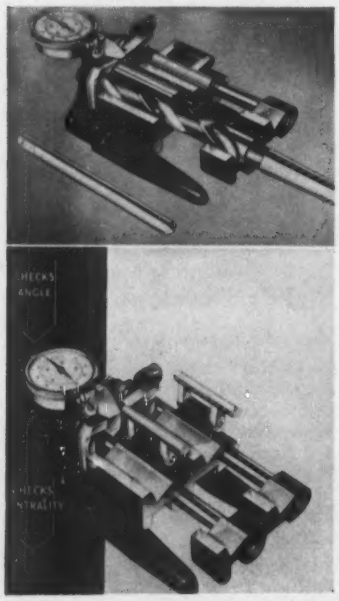


Carbide-Tipped End-Mills for Penetrating End-Cutting

Three-fluted, center cutting, carbide-tipped end-mills recently added to the line of standard carbide tools made by the Super Tool Co., 21650 Hoover Road, Detroit 13, Mich. These tools are capable of penetrating end-cutting as well as routing, etc., and are designed for use in many places where conventional carbide end-mills cannot be employed. They are specifically designed for non-ferrous metals and non-metallic materials, and are available with straight and B & S taper shanks, as shown, in six sizes ranging from 3/8 to 3/4 inch, inclusive.

Gage for Checking Twist Drill Points

"Matrix" drill point measuring instrument developed for quick, accurate checking of the drill point angle and centrality of twist drills. Two vees support the straight or tapered shank drill. Centrality is read directly on an indicating dial to an accuracy of 0.001 inch. Setting standards are supplied for standard drill point angles. The instrument is furnished in two sizes, one being designed for use in checking drills from 1/4 to 3/4 inch in diameter and the other for checking drills from 3/4 inch to 2 1/2 inches in diameter. Product of Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.



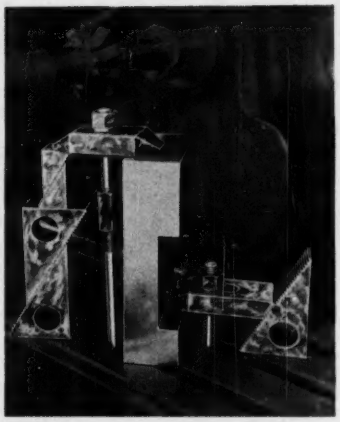
Powder-Cutting Equipment for Stainless and Alloy Steels

"Ferrojet" dispensing unit for powder-cutting of stainless and other hard-to-cut steels, announced by the National

Cylinder Gas Co., 840 N. Michigan Ave., Chicago 11, Ill. The dispenser and a cylinder of the powder-conveying gas can be mounted on a two wheel gas cylinder truck. Gas pressure and rate of powder flow are maintained automatically by the dispensing unit. The powder control valve is also automatic, operating simultaneously with the turning on and shutting off of the cutting oxygen valve on the torch. Both machine and hand cutting torches are available.

Strap Clamps Added to Line of Set-Up Tools

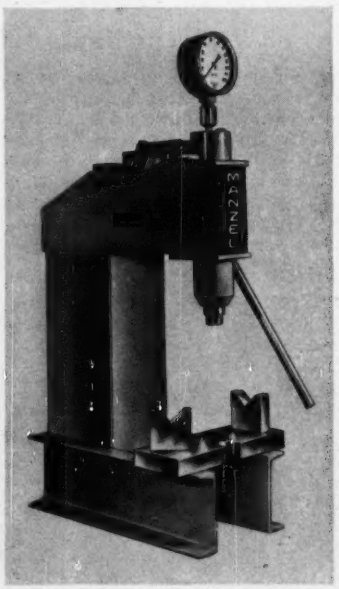
Strap clamps recently added to the line of set-up tools manufactured by the Northwestern Tool & Engineering Co., 115 Hollier Ave., Dayton 3, Ohio.

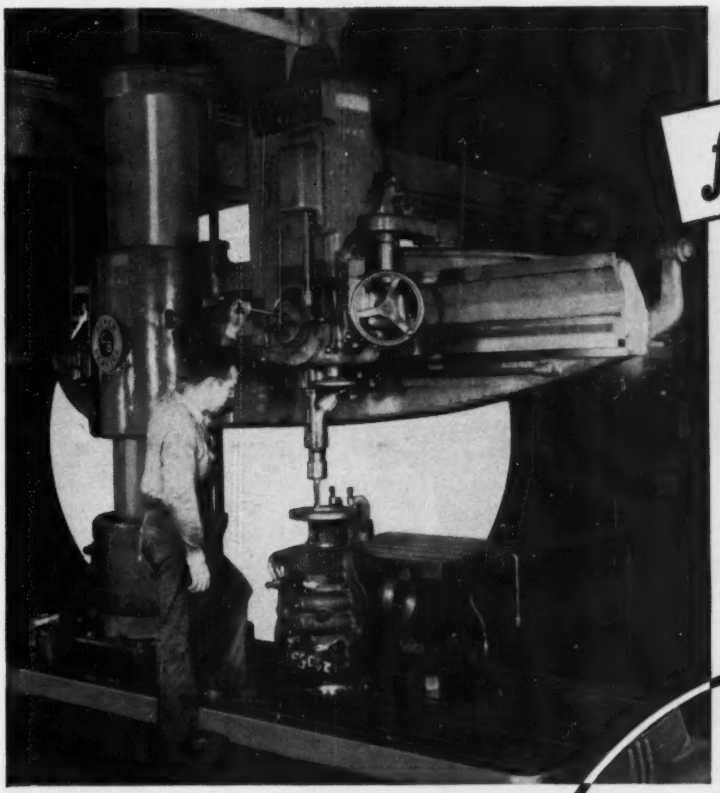


These clamps are designed for rigid clamping, and are made with a beveled nose to provide cutter clearance. They are furnished in plain and step types, and are recommended for use in punch press and other production departments as well as tool-rooms. Made in lengths of 2 1/2, 4, and 6 inches to handle studs ranging from 3/8 to 3/4 inch in diameter.

Hydraulic Arbor Press of Versatile Design

Bench type hydraulic arbor press of 10-ton capacity developed by Manzel, 315 Babcock St., Buffalo 10, N. Y., for a wide range of applications in the tool-room, laboratory, or machinery overhaul department, for such applications as straightening, material testing, bending, bushing or bearing removal and replacement, etc. Gage that registers in tons is available as optional equipment. Furnished with V-blocks and bearing plate as shown.



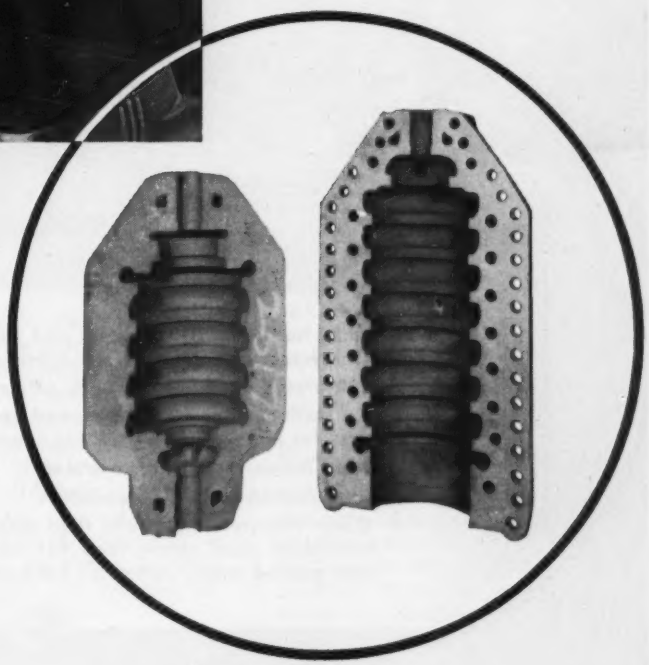


Photo—Courtesy Pacific Pump, Inc.

faster and easier... machine performance

Pacific Pump, Inc., say maximum production is the result of the faster, easier controls and fine balance of our 7′ arm, 19″ column Cincinnati Bickford Super Service Radial Drill. Here centrifugal pumps for process industries, utilities, and marine power plants, are being drilled, tapped, and spotfaced with speed and economy. Cincinnati Bickford Super Service Radial Drills will bring you too, maximum productivity at low cost.

Write for Booklet R-29.



Half shells for a centrifugal pump—approximately 100 holes are drilled—half of which are also tapped.

CINCINNATI BICKFORD

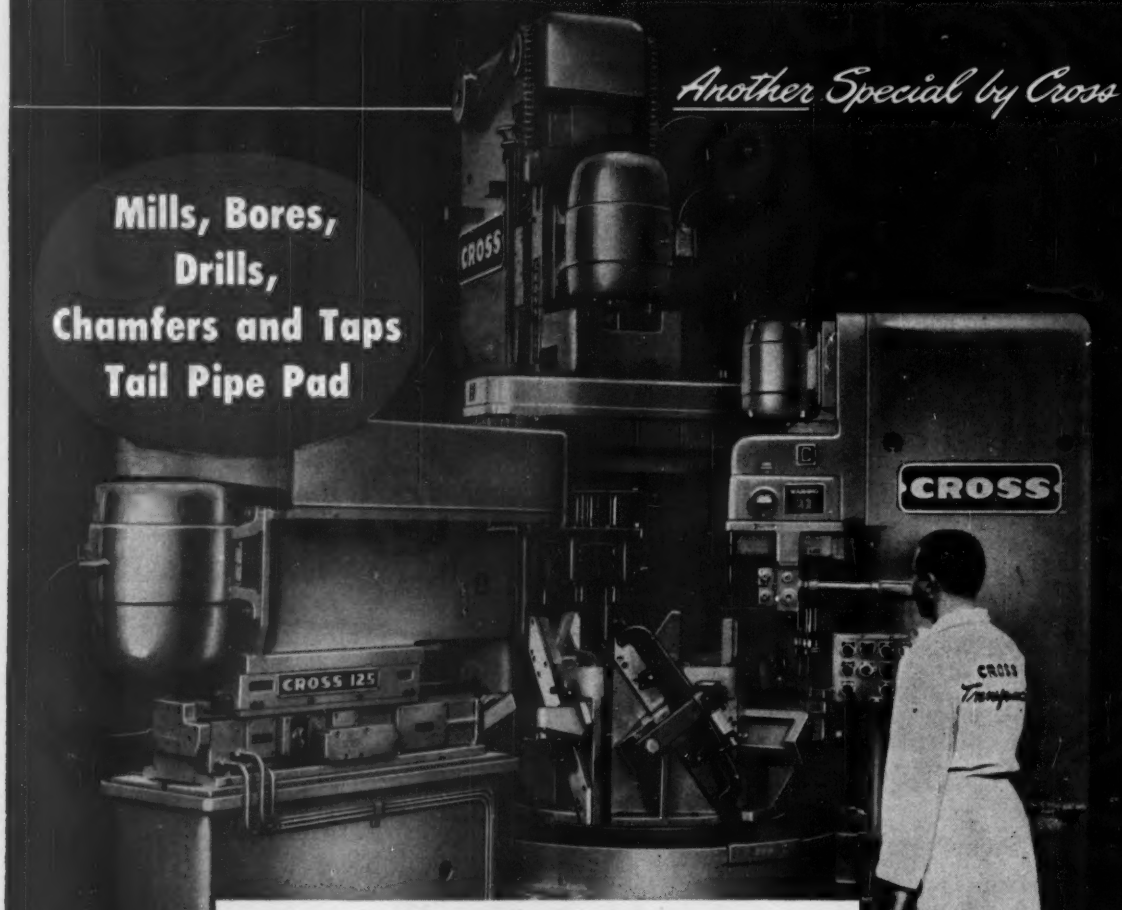
RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.

Another Special by Cross

Mills, Bores, Drills, Chamfers and Taps Tail Pipe Pad



- ★ Mills, bores, drills, chamfers and taps tail pipe pad of exhaust manifold for six-cylinder engines.
- ★ 120 pieces per hour at 100% efficiency.
- ★ Six stations—one for loading and unloading and one each for milling, boring, drilling, chamfering, tapping.
- ★ Fluid motor-driven index table.
- ★ Construction to J.I.C. standards.
- ★ Other features: Hydraulic feed and rapid traverse; individual lead screw feed for tapping; hardened and ground ways; automatic lubrication.

Established 1898

THE CROSS CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS

Between Grinds

By E. S. Salichs

Scratched

A Californian correspondent sent us an urgent request: "Would you send me the name and address of some company that sells *itching* acid for *itching* names on hardened steel?" Our reference files provided the solution to his flea, that is plea.

Kilroy in Commerce

Two ex-GI brothers started a company in Philadelphia upon their return from combat duty, and issued a booklet "What Happened to Kilroy," adopting the fictitious character in army life who was always there first. Now that they have opened another factory, the designers of the aluminum Fold-A-Way table and other devices have issued a second booklet, "How Kilroy Came Home to Stay."

The Motor or the Student Runs

Starting in February, small groups of electrical engineering students at the Case Institute of Technology are working together in designing motors from 1 to 7 1/2 H.P. The specifications will be sent to Robbins & Myers, Inc., Springfield, Ohio, where the motors will be built at no charge. The motors returned to Case, the students can check their work by making actual tests.

Shades of Grass

A list of new uses for stainless steel wire specified tennis nets "especially for public park courts where play is rough and continuous." Could this reference be to the game of lawn tennis?

No Bumpers?

Steelways comments in an article that the terminology developed by the steel industry sounds more akin to the burlesque show circuit than to the sober business of steelmaking—there are strippers, grinders, end men, dressers, dimplers, and gag straighteners. To clarify this situation possibly confusing to the layman, the duties intrinsic to each man's job are then defanned, no defined!

Quick the Postman

A Japanese twenty-year-old employed in the design department of a refrigerator product company in Nagoya wrote to our circulation manager asking for a specimen copy of MACHINERY and book information. He ended his request with "I shall be waiting for your letter with a craned neck." Not to mention an eagle eye!

Whose Opportunity?

The Advertising Council Idea Exchange of the N.M.T.B.A. presents this item: The London Times recently carried a classified ad—"Youth wanted to learn advertising in an old-established advertising agency. Good opportunity for son of a national advertiser."

Ouch, Pardon My Glove

Steel balls 5/8 inch in diameter are stitched into the ends of the four leather fingers of gloves by the Boss Mfg. Co. to protect workers who handle heavy metal sheets and shapes.

Hobbing Around with Gear Specialist CHARLES R. STAUB — Author of a feature article in this number, "Be Kind to Your Hobs," Mr. Staub knows whereof he writes. For the past twenty-three years he has been chief engineer specializing in gear cutting, shaving, lapping, and finishing equipment at the Michigan Tool Co. in Detroit. As a youngster he learned tool, die, and gage making in Tiffin, Ohio, later supplementing his practical experience with engineering training. Then he spent a number of years with such companies as the Ford Motor Co., Detroit Gear & Machine Co., Chrysler Dodge Transmission Division, and Packard Motor Co., prior to joining the Michigan Tool Co. Mr. Staub is a charter member of both the A.S.T.E. and the Engineering Society of Detroit, a member of the Metal Cutting Institute, and of A.G.M.A., in which he has been most active. In doing all this, Mr. Staub has, of necessity, become an expert in shaving time and cutting corners, as well as hobs.

News OF THE INDUSTRY

California and Washington

DIAMOND MACHINE TOOL Co., Pico, Calif., is completing construction of its new factory and general offices. The more than 55,000 square feet of manufacturing area will house all modern equipment for the manufacture of a complete line of machine tools that will include milling machines, shears, lathes, punch presses, horn presses, open-back inclinable presses, and radial drilling machines.

CARL E. SWIFT has been appointed distributor of Producto precision dowel-pins in southern California by the Producto Machine Co., Bridgeport, Conn.

W. R. LOCKWOOD has been appointed manager of the Seattle, Wash., steel service plant of Joseph T. Ryerson & Son, Inc., Chicago, Ill. Mr. Lockwood, with Ryerson for twenty-six years, formerly was sales representative at the company's St. Louis plant, manager of railroad sales at Chicago, and assistant manager at Seattle.

Illinois and Indiana

ERWIN J. BAUMRUCKER has been made executive assistant to the vice-president of the Clearing Machine Corporation, Chicago, Ill. Mr. Baumrucker has been associated with Clearing since 1937. Until recently he was acting manager of the corporation's London, England, office.

Erwin J. Baumrucker, executive assistant to the vice-president at the Clearing Machine Corporation

VASCALOY-RAMET CORPORATION, Waukegan, Ill., announces the following appointments: GEORGE T. BRENNAN, works manager; PAUL J. GUENTHERMAN, general superintendent; and CLIFFORD J. NAUTA, manager of sales promotion.

GISHOLT MACHINE Co., Madison Wis., has announced the removal of its Chicago sales office to larger quarters at 6920 W. North Ave., Chicago 35, Ill.

J. C. KUHN has been appointed vice-president of sales of the Atkins Saw Division, Indianapolis, Ind., of the Borg-Warner Corporation. Mr. Kuhn was formerly vice-president and director of sales of the Morse Twist Drill & Machine Co., New Bedford, Mass.

Louisiana and Georgia

PENNSYLVANIA FLEXIBLE METALLIC TUBING Co., Philadelphia, Pa., has appointed MURRAY-BAKER-FREDERIC, INC., 626 S. Peters St., New Orleans, La., as a distributor. Murray-Baker-Frederic will serve the territory covering New Orleans, Mobile, Baton Rouge, and Jackson.

VIKING PUMP Co., Cedar Falls, Iowa, has announced a new warehouse and repair service operation for Viking rotary pumps located at 1214 Spring St., N. W., Atlanta, Ga. C. W. DOWNING, head of the Atlanta office, will now extend his duties to manage this service. The warehouse will serve Georgia, Alabama, eastern Tennessee, North and South Carolina, and Florida.

Michigan, Missouri, and Wisconsin

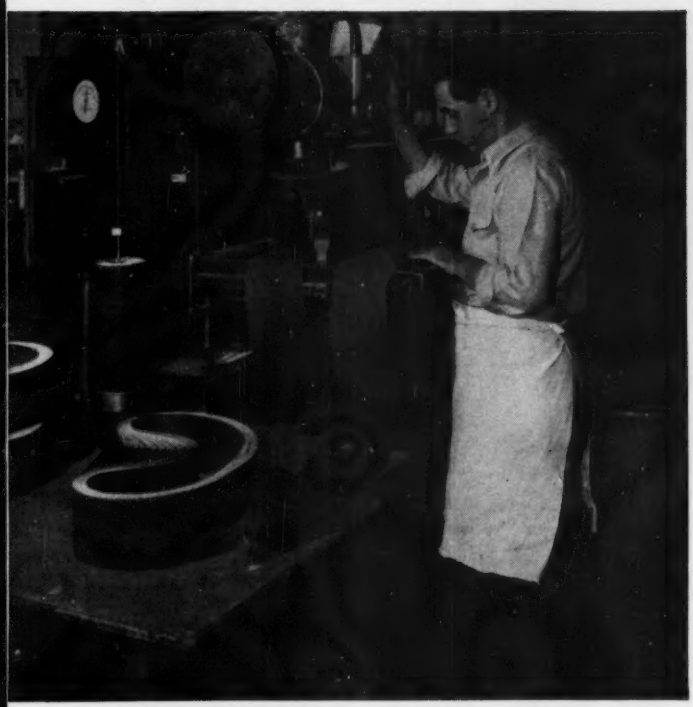
CARBOLOY DEPARTMENT OF GENERAL ELECTRIC Co., Detroit, Mich., has announced three additions to their engineering staff. DR. ROBERT F. STOOPS has joined the advance development section. He was formerly a research engineer with the Harbison Walker Refractories Co. in Pittsburgh. ANTHONY D. CORTESE has joined the design and application section, and will specialize in magnetic applications. He was recently released from active duty with the U. S. Navy, and was formerly a member of the G-E test engineering program in Schenectady. FRANK B. NUELLE has been transferred to the Detroit plant from the Carboloy Department in Schenectady.

SHEPARD BARNES, new president of the Formsprag Co., Detroit, Mich., has announced the termination of a five-year sales agreement with the Morse Chain Co. for the distribution of Formsprag clutches. Mr. Barnes stated that a staff of sales engineers will now service the manufacturers of machinery, power transmission units, motor vehicles, and airplanes using Formsprag over-running, back-stop, or indexing clutches in their products. A network of distributors will carry standard sizes in stock and provide customer service.

HANS K. REITZ has been promoted to the post of factory manager at Colonial Broach Co., Detroit, Mich. Mr. Reitz was superintendent of machine construction since 1947. WILLIAM KUKUK, whom Mr. Reitz succeeds, has resigned to devote his full time to the BUSHING SALES & ENGINEERING Co., representative for Colonial Bushings, Inc., in the Michigan area.

Hans K. Reitz, who recently received the appointment of factory manager from Colonial Broach Co.

SERIOUS PRODUCTION LOSS STOPPED BY SWITCH TO SUNVIS H.D. 700 OILS



VARNISH NO OBSTACLE—This is one of the many presses of various sizes which form joints in abrasive sanding belts for production use in the automobile, jet engine and woodworking industries, as well as many others. Six years ago equipment like this press needed costly maintenance at frequent intervals because of varnish formation. Then a Sunvis H.D. 700 Oil was adopted as the hydraulic medium, and the trouble disappeared like magic.

NO OIL CHANGE—This large press is used for joining abrasive belts used in polishing stainless steel. Although the oil temperature at which it operates is 130 F, the 200-gallon charge of Sunvis H.D. 700 is still in excellent condition after nearly four years' use.

Among the 30,000 types of abrasive specialties made by Behr-Manning Corporation, Troy, N.Y., Division of Norton Company, are sanding belts requiring smooth, uniform joints. Dozens of hydraulic presses, ranging in capacity from 5 to 150 tons, form the joints to the same thickness as the belts.

The hydraulic oil in use six years ago created a production obstacle by forming varnish in the pumps and valves. At least once a year the systems had to be overhauled and the pumps sent to the manufacturer for repairs, with consequent production loss.

Behr-Manning then changed to Sunvis H.D. 700 Oils, as suggested by a Sun representative. Because of the detergent-dispersive characteristics and high stability of these oils over a wide range of speeds, loads and temperatures, varnish formation was immediately cleared up. Since that time, no overhauls traceable to oil have been necessary. Annual savings in pump repairs have been substantial and no oil changes have yet been required.

For complete information about "Job Proved" Sunvis H.D. 700 Oils, fill out the coupon below.

SUN OIL COMPANY, Dept. M-2
Philadelphia 3, Pa.

We are having trouble that may be caused by an inadequate hydraulic oil.

☐ Please send me booklet "Sunvis H.D. 700 Oils."

☐ Please have a Sun representative contact me.

Name_____

Title_____

Company_____

Street_____

City_____ Zone____ State_____

SUN INDUSTRIAL PRODUCTS

SUN OIL COMPANY, PHILADELPHIA 3, PA. • SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

SUNOCO®

CHARLES E. GLENNON has been appointed sales engineer for the Platecoil Division of the Kold-Hold Mfg. Co., Lansing, Mich. Mr. Glennon comes to Kold-Hold with six years' experience as chief of the Industrial Division and production engineer for the Chicago Chemical Procurement District of the United States Army.

STEEL CITY TESTING MACHINES, INC., has moved to a new and larger plant located at 8817 Lyndon Ave., Detroit, Mich.

WESTINGHOUSE ELECTRIC CORPORATION, Pittsburgh, Pa., has announced the creation of a St. Louis, Mo., branch office. The office will function in addition to the present southwestern district headquarters office. E. S. REHAGEN was named branch manager. A veteran of twenty-five years with Westinghouse, Mr. Rehagen comes to his new position from that of supervisor of the electric utility department. Four sales supervisors have been appointed to the new branch: FRED N. WIGHTMAN, BURL J. SNOW, EDWARD B. SCRUGGS, and BEN H. MARSHALL. ROY D. CALL was made branch service manager, and VERNON B. WILFLEY, engineering manager, supervising the district consulting and application engineering staff.

LOUIS ALLIS, JR., formerly vice-president in charge of sales of the Louis Allis Co., Milwaukee, Wis., has been elected a vice-president of the company and joins with his brother, JOHN W. ALLIS, in the over-all active management of the company's operations. C. G. SKIDMORE, formerly sales manager, was elected vice-president in charge of sales and will also perform the function of general sales manager.

New England

NORTON CO., Worcester, Mass., announces the retirement of EDWARD G. PETHERICK, Los Altos, Calif., who for twenty-five years has been the company's abrasive engineer covering northern California, southern Oregon, and western Nevada. NORMAN R. EKHOLM, Bellevue, Wash., abrasive engineer, is replacing Mr. Petherick, and ARTHUR W. COX, Studio City, North Hollywood, Calif., will take over Mr. Ekholm's territory. ALFRED C. WOMER, with Norton since 1935, has been appointed field engineer for the Cleveland area.

GEORGE B. HOWELL has been named manager of manufacturing for the welding department at Fitchburg, Mass., of the General Electric Co., Schenectady, N. Y. Mr. Howell, who has been with G-E for six years, was superintendent of manufacturing for the department at the time of his promotion. He succeeds THOMAS SPROULE, who has joined the Manufacturing Services Division of the company.

George B. Howell, manager of manufacturing for the welding department of the General Electric Co.

REED-PRENTICE CORPORATION, Worcester, Mass., recently completed a new factory building which provides 23,000 additional square feet of floor space for the assembly of large vertical milling machines. The company also manufactures engine and toolroom lathes, die-casting machines, plastic injection molding presses, and portable power chain saws.

WARREN S. GARDNER, JR., has been named southern representative for the Bay State Tap & Die Co., Mansfield, Mass. Mr. Gardner will cover Virginia, North and South Carolina, Georgia, Alabama, Mississippi, Tennessee, and part of Louisiana.

WILLIAM E. ROGERS has been made sales manager of the Skinner Electric Valve Division of the Skinner Chuck Co., New Britain, Conn. Mr. Rogers will have complete charge of distribution and market research in connection with the solenoid valves manufactured by the Division.

FENN MFG. CO., Hartford, Conn., is building a new 72,000-square-foot plant which will double the company's production capacity for the manufacture of rotor heads and transmissions for Sikorsky helicopters. F. H. MCGRAW & Co., of New York City, has been awarded the building contract.

MECHANEERS, INC., of Bridgeport, Conn., has announced the acquisition of a plant at the Bridgeport Municipal Airport. This increase in productive space will permit rapid delivery of all types of aircraft assembly jigs, tools, and dies as well as metal- and fabric-covered assemblies and surfaces.

RICHARD A. MODIG was recently appointed general sales manager of the Holo-Krome Screw Corporation, Hartford, Conn., manufacturer of cold-forged socket screw products.

TAFT-PEIRCE MFG. CO., Woonsocket, R. I., announces two organization changes: WENDELL F. CARNEY, formerly sales manager of the Chicago territory, has been appointed New York sales manager to replace Joseph N. Tellier, retired. The Taft-Peirce New York office is located at 5301 Woolworth Bldg. FRANK G. BILLMIRE will replace Mr. Carney as sales manager of the Chicago territory. The Chicago office is located at 564 W. Randolph St.

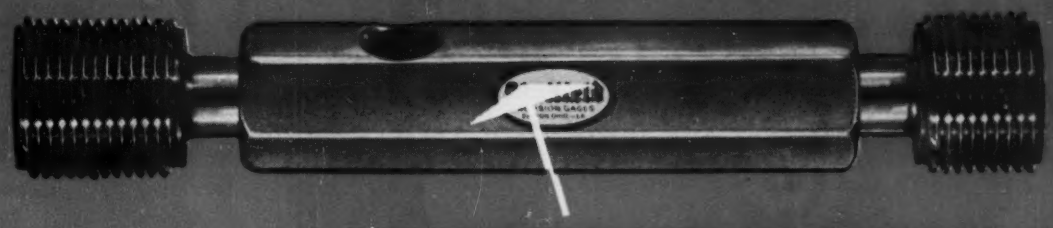
New York and New Jersey

GENERAL ELECTRIC CO., Schenectady, N. Y., announces that the general managers of eight operating divisions have been elected vice-presidents by the board of directors. Those elected are: JAMES M. CRAWFORD, general manager of the Motor and Generator Division, Schenectady, N. Y.; FRANCIS E. FAIRMAN, general manager of the Transformer and Allied Products Division, Pittsfield, Mass.; CRAMER W. LAPIERRE, general manager of the Aircraft Gas Turbine Division, Evendale, Ohio; CLARENCE H. LINDER, general manager of the Major Appliance Division, Louisville, Ky.; HAROLD A. MACKINNON, general manager of the Component Products Division, Fort Wayne, Ind.; CHARLES K. RIEGER, general manager of the Small Appliance Division, Bridgeport, Conn.; GLENN B. WARREN, general manager of the Turbine Division, Schenectady, N. Y.; and WILLIAM C. WICHMAN, general manager of the Industrial Power Components Division, Plainville, Conn.

JOHN D. HARBY has been promoted to superintendent of instrument engineering, and J. DONALD DUTCHER to superintendent of instrument manufacturing, by the Bausch & Lomb Optical Co., Rochester, N. Y. Mr. Harby joined the optical firm in 1939, and since 1949 has been in charge of instrument engineering and inspection. Mr. Dutcher became associated with the company in 1936, and was promoted to foreman of the instrument assembly department the following year.

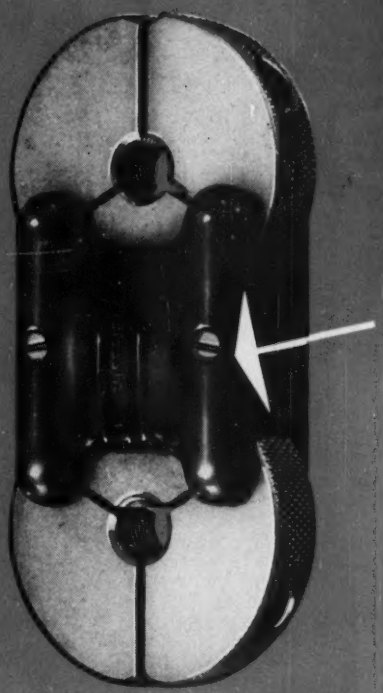
ENGELBERG HULLER CO., INC., Syracuse, N. Y., has announced the purchase of the ROME MACHINERY SALES & ENGINEERING CO., Rome, N. Y., manufacturer of buffing and polishing lathes, which will be operated as the

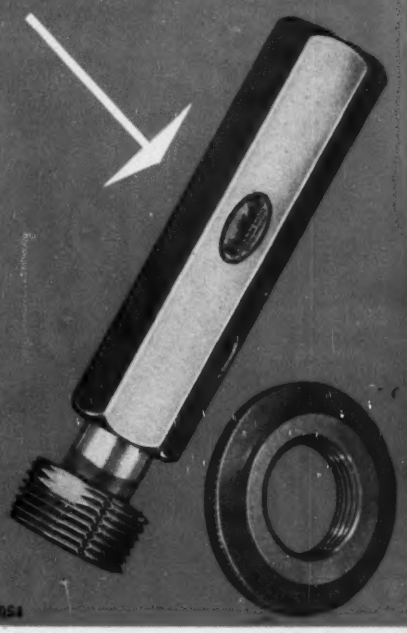
(Continued on page 250)



SHEFFIELD THREAD GAGES

NEW PRICES STOCK DELIVERIES





The magnitude of current defense procurement pyramided on unprecedented civilian needs has made it practicable for Sheffield to more than triple its manufacturing facilities for standard thread gages . . . and to put them on a mass production basis.

Mass production methods have reduced manufacturing costs as they normally do. Mass production coordination has made it possible to build up complete stocks of standard gages and maintain these stocks at full quota.

Sheffield's policy is to pass its manufacturing savings on to you in reduced gage prices. Thus you can now have Sheffield quality at a low price and without waiting.

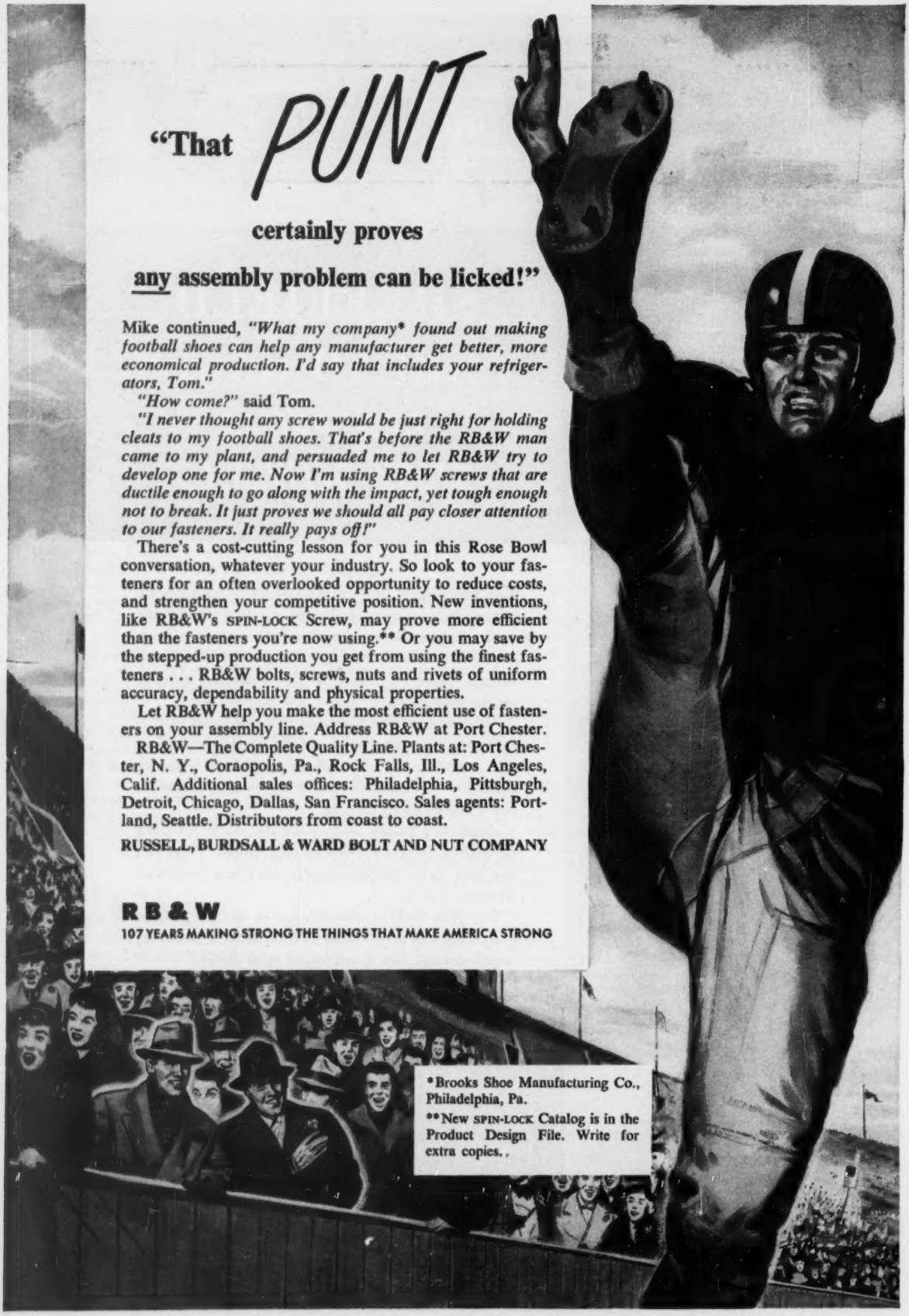
See your local representative or write us. Your quotation will go forward as soon as we know your requirements. Get them in the mail today.

the *Sheffield* CORPORATION
DAYTON 1, OHIO, U.S.A.

GAGES • MEASURING INSTRUMENTS • MACHINE TOOLS
CONTRACT SERVICES • THREADING TOOLS

SHEFFIELD HEADQUARTERS

REPRESENTATIVES IN PRINCIPAL COUNTRIES
In Australia, the Sheffield Corporation of Australia Pty. Ltd., Melbourne



"That PUNT certainly proves any assembly problem can be licked!"

Mike continued, *"What my company* found out making football shoes can help any manufacturer get better, more economical production. I'd say that includes your refrigerators, Tom."*

"How come?" said Tom.

"I never thought any screw would be just right for holding cleats to my football shoes. That's before the RB&W man came to my plant, and persuaded me to let RB&W try to develop one for me. Now I'm using RB&W screws that are ductile enough to go along with the impact, yet tough enough not to break. It just proves we should all pay closer attention to our fasteners. It really pays off!"

There's a cost-cutting lesson for you in this Rose Bowl conversation, whatever your industry. So look to your fasteners for an often overlooked opportunity to reduce costs, and strengthen your competitive position. New inventions, like RB&W's SPIN-LOCK Screw, may prove more efficient than the fasteners you're now using.** Or you may save by the stepped-up production you get from using the finest fasteners . . . RB&W bolts, screws, nuts and rivets of uniform accuracy, dependability and physical properties.

Let RB&W help you make the most efficient use of fasteners on your assembly line. Address RB&W at Port Chester.

RB&W—The Complete Quality Line. Plants at: Port Chester, N. Y., Coraopolis, Pa., Rock Falls, Ill., Los Angeles, Calif. Additional sales offices: Philadelphia, Pittsburgh, Detroit, Chicago, Dallas, San Francisco. Sales agents: Portland, Seattle. Distributors from coast to coast.

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*Brooks Shoe Manufacturing Co., Philadelphia, Pa.

**New SPIN-LOCK Catalog is in the Product Design File. Write for extra copies.

PRODUCT INFORMATION SERVICE

Use the postage-free postcard below for further information on New Catalogues described in the February, 1953, issue of MACHINERY. Circle key number of item in which you are interested and print name and address on postcard.

NEW CATALOGUES

VINYLITE RESIN—Bakelite Co., a Division of Union Carbide & Carbon Corporation, 300 Madison Ave., New York 17, N. Y. Technical release No. 12 giving specifications, formulations, and uses as a surface coating of Vinylite resin VMCH. The addition of plasticizers, stabilizers, and solvents are discussed, as well as methods of selecting and using pigments. Copies of this booklet may be obtained by writing direct to the Bakelite Co.

AUTOMATIC DIEING MACHINES—Henry & Wright Division of Emhart Mfg. Co., Hartford, Conn. Catalogue 53 comprises sixty pages; gives complete specifications on high speed automatic dieing machines for the production of stampings by the progressive die method. Catalogue can be obtained free of charge by making request on company letterhead.

CUTTING TOOL SERVICE—Rutland Tool Service, 1617 E. McNichols Rd., Detroit 3, Mich. Pamphlet pertaining to the conversion of standard high-speed steel and carbide cutting tools into special tools. A list gives the names of companies whose tools are regularly handled. Bulletin available upon letterhead request.

METAL CUTTING TOOLS—Illinois Tool Works, 2501 N. Keeler Ave., Chicago 39, Ill. Catalogue 101 lists wide selection of standard tools including end mills, saws, milling cutters, tool bits, hobs and shaper cutters. Copies available on request directed to concern.

FLAME-PLATING—Linde Air Products, Division of Union Carbide and Carbon Corporation, New York City. Booklet 8065, describing the application of undiluted coatings of powdered metals such as tungsten carbide to metal parts. The properties of the coatings are discussed as well as the results of abrasive wear tests. Advantageous uses of flame-plated coatings under conditions of frictional or abrasive wear are described. 1

HIGH-SPEED INDUCTION MOTORS — Onsrud Machine Works, Inc., Chicago, Ill. Bulletin 1142, supplying useful data pertaining to the application of high-speed induction motors ranging from 1/4 to 100 H.P. in capacity and with spindle speeds ranging from 3600 to 21,000 R.P.M. The value of a centrifugal thrust loader built into the spindle and bearing assembly is discussed. 2

HYDRAULIC POWER UNITS—Vickers Incorporated, Detroit, Mich. Bulletin 52-45 describing custom-built hydraulic power units which can be individually designed to include all the necessary pumps, valves, intermediate piping, oil reservoir, motors, controls, etc. in one self-contained unit. Oil filters, air cleaners, oil level gages, fittings, etc. are included. 3

HYDRAULIC PRESSES—Verson Allsteel Press Co., Chicago, Ill. Catalogue H-52 describing hydraulic presses of the straight-side, post, double-action, gap-frame and horn types, as well as special models. These presses are illustrated with line drawings, and complete specifications are given in table form. The Hydrol speed circuit is described in detail. 4

GEAR SPEED REDUCERS—D. O. James Mfg. Co., Chicago, Ill. Catalogue 47-B containing 88 pages of engineering data intended to assist in the selection of speed reducers to meet specific power transmission problems. The catalogue has three subdivisions which deal, respectively, with motorized gear speed reducers, motor reducers, and gear speed reducers. 5

HYDRAULIC SYSTEMS—Greer Hydraulics, Inc., Brooklyn, N. Y. Bulletin 900 showing central hydraulic systems for equipment used in the rubber and plastics industries. Compression molding press systems are described and weight-loaded and hydro-pneumatic accumulator systems are compared. Hook-ups for various conditions are illustrated. 6

LINK BELTS—Link-Belt Co., Chicago, Ill. Book 2403 describing all twenty-two stock sizes of "Steel" Link-Belt intended for light drive and conveying service and also for application to agricultural equipment. Steel Link-Belt is detachable chain of hook and bar construction, formed from strip steel by progressive dies...7

INCLINABLE PRESSES—Federal Press Co., Elkhart, Ind. Catalogue containing details of open-back, inclinable presses, made in standard dial-feed, high-speed, and special types in capacities from 6 to 80 tons. The catalogue features the new Smooth-Air, clutch-brake mechanism and electro-pneumatic controls. 8

TRAINING SHEET METAL WORKERS—Niagara Machine & Tool Works, Buffalo, N. Y. Bulletin 103-D presents typical floor layout for school shops intended for the training of young men in sheet metal work. Equipment required to meet the needs of shops of various sizes is listed. Working data for students is given in tabular form. 9

UNIVERSAL GRINDING MACHINES—Brown & Sharpe Mfg. Co., Providence, R. I. Two bulletins describing the Nos. 1, 2, 3 and 4 universal grinding machines. Many new features are described and specifications are given in detail. Provisions which have resulted in increased flexibility are stressed. 10

CARBIDE DIES—Carboloy Department of General Electric Co., Detroit, Mich. Catalogue including new list of header die nibs and information on wire flattening rolls, welding rod coating dies and capstan rings. Also included are round-hole dies, shape dies, mandrels, wire die bushings, extrusion dies, etc. 11

MIDGET ELECTRIC MOTORS—General Die and Stamping Co., New York City. Circular announcing a line of midget electric motors with multipurpose gear trains. These Kasson Roto-Sho motors are available in seven models for operation on 110-120 volt, alternating current, of 50 to 60 cycles. 12

CONTINUOUS GAGES AND CONTROLS—Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford, Conn. Circular 553, describing the versatility of continuous gages and controls for use with metal, wire, foil, plastics, aluminum, paper, paperboard, and rubber. Various models and applications illustrated. 13

POWER BRUSHING—Osborn Mfg. Co., Cleveland, Ohio. A brochure dealing with the use of power driven brushes for obtaining surface finish. The No. 3 work holder brushing lathe is described as well as various types of brushes. Operations in which power has resulted in better products, are illustrated.....14

ROTARY CUTTERS — M. A. Ford Mfg. Co., Inc., Davenport, Iowa. Catalogue 207 giving illustrations and specifications concerning 365 shapes and sizes of high-speed steel rotary files, ground cutters, countersinks, rasps, carbide cutters, and mills and grinding burrs. Recommended operating speeds are given...15

TAPPED AND LOCKING INSERTS—Brush Nail Expansion Bolt Co., Greenwich, Conn. Catalogue describing inserts with tapped holes and screw locking inserts which are available in aluminum, steel and other materials. Both types of inserts can be applied to various devices and machines. 16

INDUCTION FURNACE FOR DIE-CASTING — Ajax Engineering Corporation, Trenton, N. J. Four-page folder describing the characteristics of a combination induction holding furnace and pumping unit called "Ajaxomatic." This equipment is intended for use in die-casting aluminum and zinc alloys. 17

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FILING MACHINE—All American Tool & Mfg. Co., Skokie, Ill. Folder describing precision filing machine designed specifically for use in die shops. Machine has such features as two overarms and a positive vertical cutting movement. 18

GRINDING MACHINE DOGS—Ready Tool Co., Bridgeport, Conn. Booklet illustrating complete Red-E line of dogs and accessories including cam-action, adjustable and reversible grinding dogs, milling machine dogs and driver, and hold downs. Capacities and prices are listed. 19

GRINDING WHEELS—Sterling Grinding Wheel Division of the Cleveland Quarries Co., Tiffin, Ohio. Folder concerning Resinoid snagging wheels intended for use on swing frame, portable, or floor stand grinders. Different Resinoid bonds are available to suit the individual job. 20

"STEEL KOLDFLO" PROCESS—Mullins Mfg. Corporation, Salem, Ohio. Bulletin 1, describing facilities for the cold shaping of steel parts to meet the requirements of concerns manufacturing commercial products. The process eliminates certain casting, forging, and machining operations. 21

HYDRAULIC PRESSES—R. D. Wood, Philadelphia, Pa. One hundred fiftieth anniversary of this concern has been commemorated by a 32-page book which illustrates some of the methods and equipment employed in the manufacture of hydraulic presses and allied equipment. 22

COOLANT AND OIL FILTER SYSTEMS—Wm. W. Nugent & Co., Inc., Chicago, Ill. Bulletin 14A, describing coolant and cutting oil filtering systems designed for machine tools of all types. Pressure-type filters and gravity systems included. 23

AIR-OPERATED EQUIPMENT—Mead Specialties Co., Chicago, Ill. Catalogue illustrating and describing the entire line of single- and double-acting air cylinders as well as air-operated presses, vises, chucks, valves, hammers and work feeders. 24

VIBRATION ANALYSIS INSTRUMENTS—International Research & Development Corporation, Columbus, Ohio. Booklet outlining the features of the "Vibratron" instrument for the analysis and evaluation of vibration. Technical applications are illustrated. 25

SHELL LATHES—Wm. K. Stametz Co., Pittsburgh, Pa. Bulletin 100-D describes their line of single-purpose lathes developed for rough and finish turning high explosive shells. Machines are built for shells ranging in size from 75 to 240 millimeters. 26

INTERNAL GEAR FINISHER—Michigan Tool Co., Detroit Mich. Bulletin 870-C-52, describing model 870-C internal gear finisher for spur and helical gears up to 12 inches in outside diameter. Transverse and plunge shaving are features discussed. 27

WORM GEAR SPEED REDUCERS—D. O. James Mfg. Co., Chicago, Ill. Catalogue 46-B describing motorized worm-gear speed reducers available for horizontal or vertical drives with ratios from 5.66 to 1 up to 100:1 and from 1/8 to 30 H.P. 28

DRILLING, BORING, AND FACING MACHINES—Modern Industrial Engineering Co., Detroit, Mich. Bulletin describing four-way drilling, boring and facing machines designed specifically for machining aircraft jet engine housings. 29

STEEL PRODUCTS—Bethlehem Steel Co., Bethlehem, Pa. Booklet 284-A, giving a condensed description of the wide variety of products made by the concern, ranging from wire, rods, and billets to buildings, bridges, and machinery. 30

UPRIGHT DRILLING MACHINE—Kurt Orban Co., Inc., New York City. Bulletin describing Alfing Model BK25 heavy-duty upright drilling machine which has a drilling capacity of 1 inch in steel and 1 1/4 inches in cast iron. 31

JET-ENGINE BLADE PROFILING MACHINES—Ex-Cell-O Corporation, Detroit, Mich. Bulletin 50620, describing profiling machines for precision milling, grinding and polishing the airfoil form of jet-engine blades in automatic cycles. 32

V-BELTS—Allis Chalmers Mfg. Co., Milwaukee, Wis. Bulletin describing the advantages of Texrope grommet V-belts. Cross-sectional illustrations show how a high gripping pressure is obtained under all load conditions. 33

TITANIUM ALLOYS—Mallory-Sharon Titanium Corporation, Niles, Ohio. Bulletin describing the advantages of titanium and including a comprehensive chart which gives tentative nominal properties of titanium alloys. 34

WELDING EQUIPMENT—Modern Engineering Co., St. Louis, Mo. Catalogue 150, describing equipment for all types of oxy-acetylene welding and cutting operations. Comprehensive guide for welders is included. 35

GAGES, PLUG AND THREAD—Size Control Co., Chicago, Ill. Catalogue 53, covering entire line of reversible "Go" and "No-Go" plug gages, reversible thread gages, AGD gages, and centerless lapping machines. 36

COLMONOY SPRAYWELDER AND SPRAYWELD PROCESS—Wall Colmonoy Corporation, Detroit, Mich. Bulletin describing latest developments in the fusion bonding of Colmonoy hard-facing alloys to metal parts. 37

CONTOUR SHEAR—Wales-Strippit Corporation, North Tonawanda, N. Y. Catalogue which features inside cutting, beading and flanging of sheet metal parts up to 10 gage mild steel and 11 gage stainless steel. 38

MARKING TOOLS—M. E. Cunningham Co., Pittsburgh, Pa. Brochure of 28 pages illustrating and describing Mecco marking tools including stamps, holders, hammers, fixtures, machines and type. 39

HOLE QUENCHER—Palmer Mfg. Co., Cleveland, Ohio. Bulletin describing machines for quenching holes in die blanks. Holes from 1/16 inch to 3 inches in diameter can be accommodated. 40

CHAIN AND TROLLEY HOISTS—Harrington Co., Philadelphia, Pa. Folder P-5, describing lightweight Peerless Packet chain and trolley hoists. Advantages, capacities and prices are given. 41

COLD TREATMENT UNITS—Bowser Technical Refrigeration, Terryville, Conn. Bulletins describing units for the cold treatment of metals at temperatures down to approximately — 200 degrees F. 42

COUPLING TAPPING MACHINES—William K. Stametz Co., Pittsburgh, Pa. Bulletin 100-C, covering coupling tapping machines for automatic tapping of pipe couplings. 43

QUENCHING OILS—Sun Oil Co., Philadelphia, Pa. Bulletin entitled "Sun Quenching Oils," describing applications in various plants where difficulties existing with other oils were rectified. 44

CARBIDE TOOLS—Nelco Tool Co., Manchester, Conn. 32-page catalogue describing nearly 800 carbide tools regularly maintained in stock: twist drills, grinders and lathe centers, end mills, face mills, and keyseat cutters. 45

LATHE CENTER TIPS—Diamonds and Tools, Inc., Detroit, Mich. Bulletin describing cast Colmonoy wear-resistant tips for application to worn lathe centers. These tips are available also on new centers. 46

SPEED REDUCTION DRIVES—American Pulley Co., Philadelphia, Pa. Catalogue concerning Shaft-King speed reduction drives which describes features and gives considerable tabulated information. 47

STUD-WELDING MANUFACTURE—KSM Products, Inc., Merchantville, N. J. Booklet describing facilities for the production of cold-rolled threaded studs and stud-welding equipment. 48

DRILL PRESSES—South Bend Lathe Works, South Bend, Ind. Catalogue 5206, describing complete line of drill presses and production boosting attachments. 49

SERVO AMPLIFIERS—Industrial Control Co., Wyandanch, Long Island, N. Y. Catalogue illustrating servo amplifiers, dynamic analyzers, and other electrical instruments. 50

HYDRAULIC PRESSES—Clearing Machine Corporation, Chicago, Ill. Bulletin 216, describing hydraulic presses of various types and special Clearing features. 51

MOTORIZING CONE-DRIVEN MACHINES—Western Mfg. Co., Detroit, Mich. Circular describing drives for motorizing cone-driven standard or special machine tools. 52

ELECTRIC MOTORS—Doerr Electric Corporation, Cedarburg, Wis. Bulletin 100, describing standard and special electric motors of capacities ranging from 1/30 to 5 H.P. 53

RESISTANCE SOLDERING—Wasserlein Mfg. Co., Inc., Joliet, Ill. Brochure explaining resistance soldering and outlining its uses for production and maintenance. 54

Product Information Service

Use the postage-free postcard below for requesting further information on New Catalogues. Simply circle the numbers of the items in which you are interested. Please print your name and address.

PLEASE SEND US MORE INFORMATION. Circle below item numbers on which you wish further information.

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M-2/53

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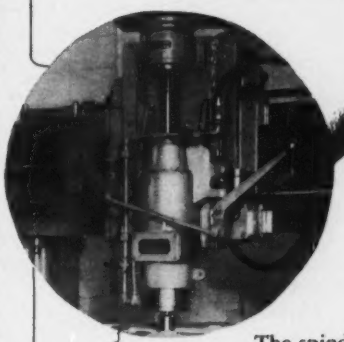
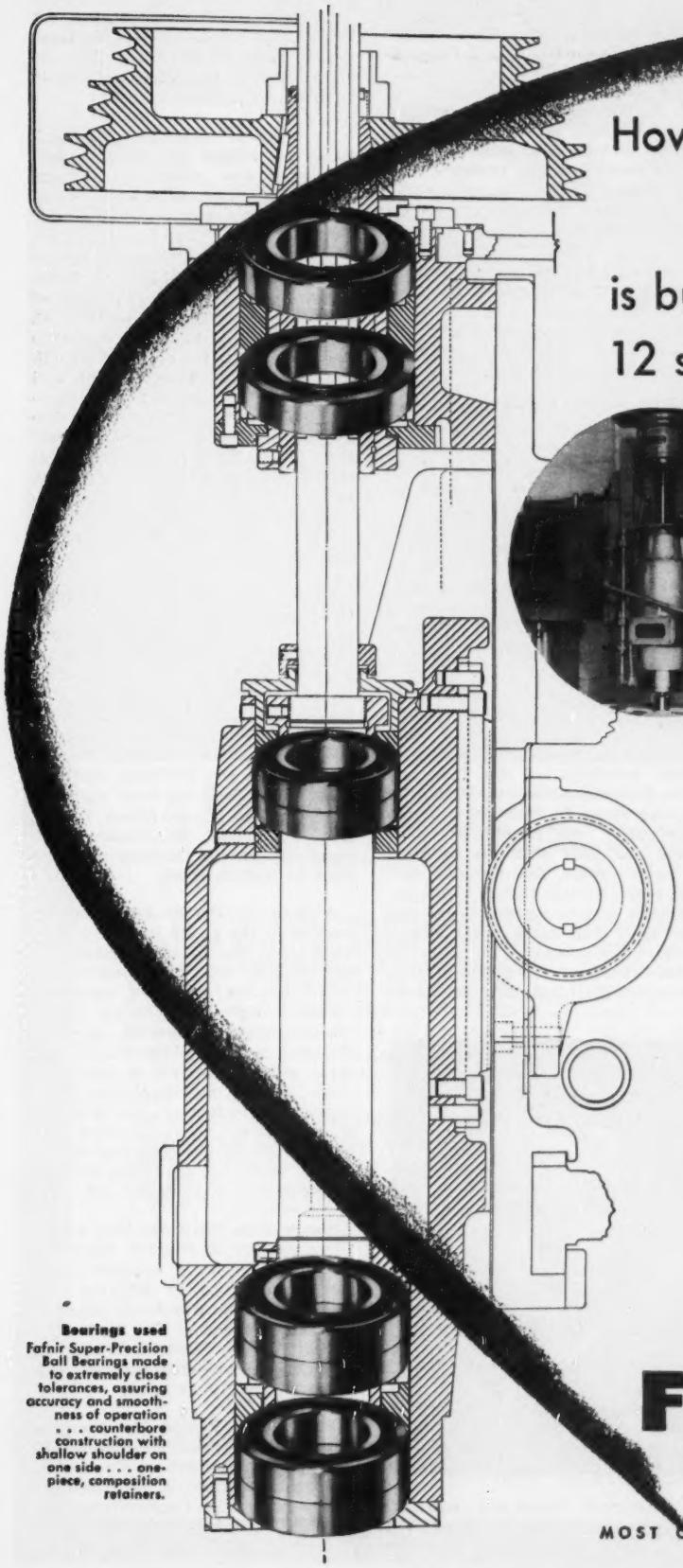
How "ABUSE CAPACITY" is built into a 12 speed spindle





Bearings used Fafnir Super-Precision Ball Bearings made to extremely close tolerances, assuring accuracy and smoothness of operation . . . counterbore construction with shallow shoulder on one side . . . one-piece, composition retainers.

The spindle of Pratt & Whitney's 40" Vertical Profiler and Miller is designed for 12 operating speed ranges from 260 to 6200 r.p.m. Machine operations may be confined to continuous production at any one speed for extended periods. The diversification of operating conditions represented puts an extremely heavy burden on spindle bearings.

"Abuse capacity" is provided by the aristocrats of all bearings . . . Fafnir Super-Precision ball bearings. Four pairs support the main spindle and drive shaft. Notice how they are arranged in the cross section diagram. This set-up not only assures positive axial and radial rigidity, but also provides for shaft expansion. The bearings run cool under varying conditions of load and speed . . . conserve power . . . need no adjustment . . . and are permanently grease packed.

Whatever your bearing problem, a few minutes spent with a Fafnir representative may help you solve it as successfully. The Fafnir Bearing Company, New Britain, Conn.

FAFNIR
BALL BEARINGS

MOST COMPLETE LINE IN AMERICA

Rome Machinery Division of Engelberg Huller. Manufacturing operations will be moved to Syracuse. NORMAN CHESTER, former owner and general manager of the Rome concern, has become affiliated with Engelberg Huller.

JOHN CHENEY has been appointed sales representative for Washington, Oregon, Idaho and western Montana by J. H. WILLIAMS & Co., Buffalo, N. Y. Mr. Cheney will be located at 9111 Fortuna Drive, Mercer Island, Wash. ANDREW MEZEY has been appointed sales representative in Kansas, Nebraska, and Missouri, making his headquarters in St. Louis, Mo.

DAVID I. DILWORTH, JR., has been appointed to the newly created post of assistant director of metallurgy for the Crucible Steel Co. of America, New York City. Mr. Dilworth moves up from Crucible's Sanderson-Halcomb Works, Syracuse, N. Y., where he was chief metallurgist. Assuming Mr. Dilworth's post at Syracuse is EUGENE A. MARCH, formerly supervisor of metallurgical control at Sanderson-Halcomb.

F. L. BRYANT has been named superintendent for the Niagara Falls, N. Y., plant of the Hooker Electrochemical Co. In his new capacity Mr. Bryant will be in charge of production, maintenance engineering, traffic, and plant stores. J. D. SWEENEY has been named assistant superintendent of production. Since 1951, Mr. Sweeney has been in charge of the Chemical Corps plant operated by Hooker.

MOREY MACHINERY CO., New York City, announces the appointment of E. Payson Blanchard as director of sales in charge of New Domestic Machinery Division. Mr. Blanchard was associated with the Bullard Co. for thirty years, leaving them in 1950 to go with the NPA in Washington. In November 1952, he joined the Morey Machine Co.

FARREL-BIRMINGHAM CO., INC., Ansonia, Conn., has appointed ROGER E. VAUGHAN to the position of assistant general manager of the company's subsidiary, Consolidated Machine Tool Corporation, Rochester, N. Y. Mr. Vaughan has been assistant general manager of the Farrel-Birmingham plant of Buffalo, N. Y., since 1943.

GILBERT T. COOVERT has been appointed general manager of the V & O Press Co. Division of the Emhart Mfg. Co., Hudson, N. Y. Since joining V & O in 1950 as personnel manager, he was successively acting factory manager, factory manager, and assistant general manager.

JAMES W. WELLS has been elected vice-president of Giebel, Inc., New York City, machine tool distributors. He was formerly general superintendent of the Curtiss Propeller Division of the Curtiss-Wright Corporation, Beaver, Pa.

F. H. WEBSTER has been promoted to the position of manager of the western division sales office, Chicago, Ill., by Hyatt Bearings Division, General Motors Corporation, Harrison, N. J. Prior to this appointment, he was assistant manager of the Chicago office. Mr. Webster succeeds C. L. NEWBY, who has retired after thirty-four years of service with Hyatt in several sales capacities. C. W. KALCHTHALER has been appointed assistant to the general sales manager, with headquarters at Harrison.

COLORADO FUEL & IRON CORPORATION, steel producer, New York, N. Y., has acquired the business of JOHN A. ROEBLING'S SONS CO., Trenton, N. J., and will be operated by John A. Roebling's Sons Corporation, a newly formed subsidiary. CHARLES ALLEN, JR., and A. F. FRANZ, chairman of the board of directors and president, respectively, of Colorado Fuel & Iron, assume like offices in the subsidiary. CHARLES ROEBLING TYSON becomes executive vice-president.

Ohio

ARTHUR S. ARMSTRONG has been elected president of the Cleveland Twist Drill Co., Cleveland, Ohio. He succeeds JACOB D. COX, who becomes chairman of the board. Mr. Armstrong has been with the company for twenty years, first spending several years in the factory, then becoming a service representative and later being transferred to the administrative department. In 1949, he became executive vice-president. The new board chairman, Mr. Cox, served as president of the company for thirty-three years. He will continue to take an active interest in the general affairs of the Cleveland Twist Drill Co.

Arthur S. Armstrong, new president of the Cleveland Twist Drill Co.

THROATLESS PRESS CO., Cleveland, Ohio, is a new company, owned jointly by the AUSTIN CO. and the HYDRAULIC PRESS MFG. CO., created for the development, production, and erection of large throatless presses. Officers of the new company are as follows: President, HAROLD A. HALLSTEIN, executive vice-president of Austin; vice-president, JOHN C. COTNER, H-P-M's president and general manager; treasurer, JOHN M. DOLAN, H-P-M's vice-president and general sales manager; and secretary, W. G. PATON, an Austin vice-president. The four officers, together with DR. G. B. ROBINSON, chairman of H-P-M's board, and A. T. WAIDELICH, Austin vice-president and manager of research, will comprise the board of directors of the newly formed company.

VAN H. LEICHLITER has been named vice-president of operations of the American Steel & Wire Division, Cleveland, Ohio, of the United States Steel Corporation, New York City. Mr. Leichliter, who was assistant vice-president of operations at the time of his promotion, succeeds WALTER F. MUNFORD, who recently became president of the Division. JOHN A. SLENKER has been appointed assistant vice-president of operations in Mr. Leichliter's stead. Mr. Slenker previously was district manager of operations at Duluth, Minn.

ANDREW C. PERRIN has been appointed to the newly created post of West Coast district sales manager of the Reliance Electric & Engineering Co., Cleveland, Ohio. A sales application engineer operating out of the company's Chicago, Ill., office for the past six years, Mr. Perrin will make his headquarters in San Francisco, Calif. KEITH E. CARTER, sales engineer in Pittsburgh, Pa., has been transferred to Chicago to take over Mr. Perrin's former sales engineering duties. Replacing Mr. Carter in Pittsburgh is J. EDWARD HOUSE, JR.

KENNETH R. BROCK has been named vice-president of the OK Stamping Corporation's newly acquired plant in Toledo, Ohio. In addition, Mr. Brock has been appointed assistant general manager of the Nash Mfg. Co. of Toledo. Both concerns are stamping die and stamped parts suppliers in the Middle West.

FREDERIC C. PERRON has been appointed field engineer in southeastern New York by the Bellows Co., Akron, Ohio, manufacturer of controlled air-power devices. Mr. Perron's headquarters will be at 7 W. Broad St., Mount Vernon, N. Y. FRANK R. ADAMS has

LINCOLN FINDS

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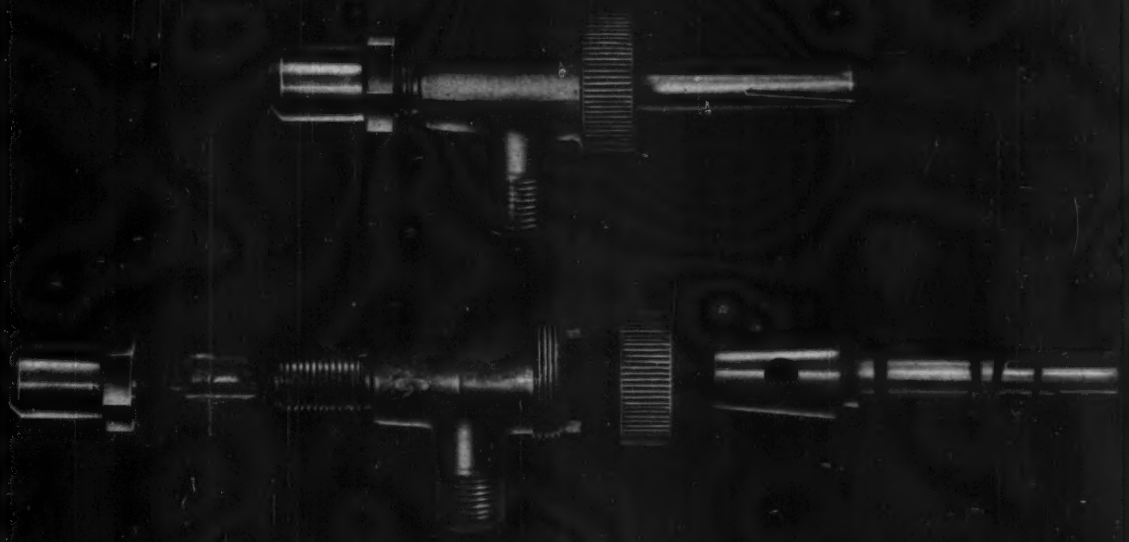

Kitchen range burner valve by Lincoln Brass Works, Inc., Detroit 16, Mich. Two different brasses are used in this valve, which is entirely of brass except for the washer and spring. Lincoln also makes valves for heaters and furnaces; flow, drain and shut-off valves for gasoline lines; shut-off valves for agricultural sprayers, and a wide variety of tube and pipe fittings, all entirely or chiefly of free-cutting brass rod and free-machining brass forgings.

Mr. D. E. DuPerow, Vice-President of Lincoln Brass Works, Inc., recently said: "Thirty-six years of brass use by Lincoln and complete acceptance by the trade is the best reason I can think of for brass superiority. If there had been any material better for our purpose, less expensive to fabricate, and more desirable to our customers, we would be using it now."

Brass has many desirable characteristics. Here are five of them that are important in Lincoln valves and fittings: 1, corrosion resistance, which means no plating is required. 2, high speed precision machining for high output, lower costs. 3, sound, non-porous structure of rod and forgings. 4, smooth performance; brass holds lubricants. 5, customer satisfaction; gas range burner valves pass the cycling test of being raised to 425°F. and back to room temperature a minimum of 10,000 times without seizure, loss of free operation, or leakage.

There are many other items besides valves that can profitably make use of the fine qualities of Revere Brass. The Revere Technical Advisory Service will gladly cooperate with manufacturers on the selection of the correct brass and its fabrication. Just call the nearest Revere Sales Office; see your telephone directory. Or write direct.

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received a similar appointment in the Saginaw, Mich., territory, with headquarters at 702 Second National Bldg., Saginaw.

DOEHLER-JARVIS CORPORATION, Toledo, Ohio, announces the appointment of new works managers for its two plants located in Toledo. JOHN W. THEES, formerly manager of the Chicago plant, becomes works manager of the No. 1 plant (Smead Ave.). CHARLES I. HODGSON, formerly chief electrical engineer of the corporation, becomes works manager of the No. 2 plant (Dixie Highway).

DAYTON SUPPLY & TOOL CO., INC., Dayton, Ohio, has been appointed a distributor for the CARBOLOY DEPARTMENT OF THE GENERAL ELECTRIC CO., Detroit, Mich. C. F. WOESSNER, vice-president of the new distributor, will direct the sale of the Department's entire line of standard tools and blanks, masonry drills, and diamond wheel dressers.

J. ROY BAREFOOT, JR., was recently elected vice-president of the Federal Machine and Welder Co., Warren, Ohio. With Federal since 1941, Mr. Barefoot became manager of operations in 1949. He is currently serving as president of the Resistance Welder Manufacturers Association.

SAMUEL H. WOOD is joining the Eaton Mfg. Co., Cleveland, Ohio, in the capacity of manager of the Marion Forge Division plant now under construction at Marion, Ohio.

O. M. MARQUARDT has become manufacturing manager of the Tocco Division of the Ohio Crankshaft Co., Cleveland, Ohio. Mr. Marquardt has been associated with the Division since 1948.

O. M. Marquardt, new manufacturing manager of the Tocco Division of the Ohio Crankshaft Co.

William H. Bennett, director of engineering for the Hydraulic Press Mfg. Co.

WILLIAM H. BENNETT, assistant sales manager of the Hydraulic Press Mfg. Co., Mount Gilead, Ohio, has been promoted to the position of director of engineering. Mr. Bennett has been active in sales and engineering work at the company since returning from the Army.

Pennsylvania and Washington, D. C.

ALUMINUM COMPANY OF AMERICA, Pittsburgh, Pa., has promoted the following personnel in its Casting Division: SANFORD H. BENNETT, works manager of the Buffalo Works, has been named chief industrial engineer of the Casting Division, at Pittsburgh, Pa.; H. E. COOK, Buffalo Works superintendent, has succeeded Mr. Bennett as works manager; NORBERT C. HILBRECHT, chief industrial engineer of the Buffalo Works, has been named superintendent in Mr. Cook's stead; and SHERWOOD WILLARD has filled the post vacated by Mr. Hilbrecht.

AMERICAN PULLEY CO., Philadelphia, Pa., announces the following appointments: HENRY H. HAMILTON, assistant manager of the materials handling division; JOSEPH C. SALETTE, JR., sales promotion and advertising manager; GEORGE L. MICHEL, district manager of the St. Louis, Mo., office; SAMUEL S. STUART, district manager of the Philadelphia, Pa., office; and JOHN J. MCFARLAND, district manager of the Minneapolis, Minn., office.

JOSEPH BECKER has retired as vice-president and general manager, Engineering and Construction Division of Koppers Co., Inc., Pittsburgh, Pa. Mr. Becker, an authority on chemical-recovery coke oven design, construction, and operation, will remain as a consultant to Koppers.

DWIGHT W. KAUFMANN has been appointed assistant manager of sales of Rem-Cru Titanium, Inc., Midland, Pa., producer of titanium and titanium alloys. The company is owned jointly by the Crucible Steel Company of America and the Remington Arms Co.

JACKSON KEMPER was recently made vice-president of H. K. Porter Co., Inc., Pittsburgh, Pa. Mr. Kemper will continue in his present capacity as general manager of the company's Watson-Stillman Fittings Divison, Roselle, N. J.

HENRY E. WARREN, secretary and general manager of Mac-It Parts Co., Lancaster, Pa., manufacturer of heat-treated alloy steel screws, was recently made president of the company, succeeding the late JOHN S. COCHRAN.

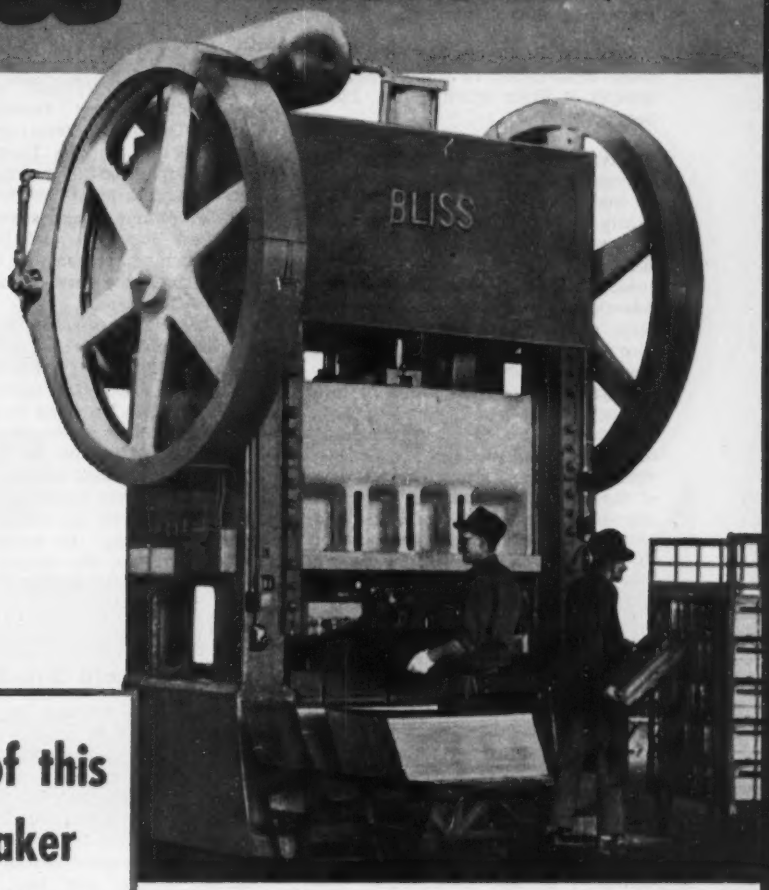
SALES AND SERVICE MACHINERY CO., 3818 Chestnut St., Philadelphia 4, Pa., has been appointed exclusive distributor for the ROCKFORD MACHINE TOOL CO. in eastern Pennsylvania, southern New Jersey and Delaware.

H. J. VAN BUSKIRK has been appointed district manager in Pittsburgh, Pa., for DeWalt, Inc., Lancaster, Pa., a subsidiary of the American Machine & Foundry Co.

GEORGE A. GADE, manager of outside sales for the Standard Pressed Steel Co., Jenkintown, Pa., has been made vice-president in charge of sales. He succeeds to the post formerly occupied by J. Whiting Friel, who vacated it almost a year ago upon his appointment as vice-president of the company. The company,

George A. Gade, who recently became vice-president in charge of sales at the Standard Pressed Steel Co.

The trend is to more stampings WITH BLISS PRESSES...



NEW 250-TON PRESS is typical of modern Bliss installations at Corry-Jamestown Mfg. Corp. This straight-side press features a sturdy box-frame construction and extra-long slide adjustment.

95% of presses of this leading desk maker are Bliss-Built!

When it comes to making steel office desks and files, Corry-Jamestown Mfg. Corp., Corry, Pa., is an acknowledged leader. And when it comes to choosing press equipment, Corry naturally turns to the leader in the press field—Bliss.

Throughout Corry-Jamestown's three plants, *95%* of the presses are *Bliss-Built*. And in its newest plant, *100%* of the presses over 10-ton capacity are *Bliss-Built*.

Rugged Bliss Straight-Side and Inclinable Presses have helped Corry maintain high quality, speed production, and minimize costs of stampings for its "STEEL AGE" desks and files.

Your local Bliss sales engineer—the trained representative of the world's largest press builder—can show you why Bliss belongs in *your* press room. Remember, Bliss can supply the right press for a given job or a complete press room.

E. W. BLISS COMPANY, CANTON, OHIO
E. W. Bliss (England) Ltd., Derby, England
E. W. Bliss Company (Paris), St. Ouen sur Seine, France

PRESSES, ROLLING MILLS, SPECIAL MACHINERY

Branch offices in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo; and Toronto, Canada. West Coast Representatives: Moore Machinery Company, Los Angeles and San Francisco; Star Machinery Company, Seattle. Other dealers in United States cities and throughout the world.

BLISS ON YOUR PRESS IS MORE THAN A NAME...IT'S A *GUARANTEE!*

this year celebrating its fiftieth anniversary, manufactures socket-head screws, lock-nuts, aircraft specialty parts, and shop equipment.

WILLIAM E. HENRY has joined the sales department in the Pittsburgh district of Firth Sterling Inc., Pittsburgh, Pa.

DAVID R. MILLER, chief of the Gage Section since 1924, National Bureau of Standards, Washington, D. C., recently retired after forty-four years of service with the Bureau. As an American delegate, he took a prominent part in 1948 in unifying the American and British standard systems of screw threads. Mr. Miller also assisted the American Petroleum Institute in formulating special international thread standards for oil-well equipment. He designed a projection comparator for measuring the angle of thread on thread gages, devised methods of measuring the lead of thread and the taper of the pitch diameter of tapered thread rings, and contributed to the development of interference methods of measuring precision gage-blocks.

World's Most Powerful Motors Near Completion

Four motors—two the largest ever built—for installation in the United States Air Force's transonic and supersonic wind tunnels at the Arnold Engineering Development Center at Tullahoma, Tenn., are nearing completion at the East Pittsburgh, Pa., plant of the Westinghouse Electric Corporation. The Center is under the command and supervision of the Air Research and Development Command, responsible for the over-all Air Force research and development program.

The motors, two rated at 83,000 H.P. each and two rated at 25,000 H.P. each, will be installed in tandem fashion. The 83,000-H.P. motors will stand 21 1/2 feet high and weigh 225 tons. Their 122-ton rotors will turn at 600 R.P.M. Although the machine has the highest stored energy of any rotating mass ever built, it can be brought to a halt in about three minutes by using its wound-rotor motors as brakes, the energy being dissipated in liquid rheostats.

Frederick Van Norman Honored on Ninetieth Birthday

In celebration of his ninetieth birthday, Frederick Dewey Van Norman, chairman of the board and a founder of the Van Norman Co., Springfield, Mass., was recently honored with a luncheon. Present on the occasion to pay tribute to Springfield's oldest active industrialist were members of the management and executive groups of the company, as well as businessmen, professional men, and civic leaders. James Y. Scott, company president, who started with the Van Norman Co. thirty-five years ago as an office boy, was toastmaster. Mr. Van Norman joined his father and brothers seventy-one years ago in Waltham, Mass., in making tools for the watch industry. He designed an original ball-bearing bore-grinding machine having a self-contained motor, and has had a major part in supervising patent applications covering the various machines and tools manufactured by the company.

(Left) Frederick D. Van Norman, chairman of the board of the Van Norman Co., receiving flowers from Leon H. Hutchins (right), director of personnel for the company, in honor of his ninetieth birthday

Obituaries

W. E. BYRNE, Midwest district manager of the Simonds Abrasive Co., Philadelphia, Pa., died on December 27 at the age of fifty-eight years. Mr. Byrne was widely known throughout the grinding wheel and abrasive industry, especially in the Chicago area.

WILLIAM E. KARNUTH, district sales manager at Syracuse, N. Y., for Peter A. Frasse and Co., Inc., New York City, died on December 16, at the age of forty-nine years. Mr. Karnuth was a sales engineer in the Frasse Buffalo district from 1923 to 1950 prior to his appointment to the Syracuse district.

FRANK M. MASON, vice-president of U. S. Electrical Motors Inc., Los Angeles, Calif., died on December 27 of a heart attack at the age of forty-two. He was general manager of the company's Atlantic plant in Milford, Conn. Prior to 1940, he was assistant chief engineer of the company's Pacific plant in Los Angeles.

* * *

With less than 10 per cent of the free world's population, and only 8 per cent of its area, the United States consumed over half of 1950's supply of such fundamental materials as petroleum, rubber, iron ore, manganese, and zinc. The President's Materials Policy Commission aims at flexibility as a corrective to broaden our usable resource base and tap new sources of supply.

POPE

SUPER-PRECISION SPINDLES

READY TODAY FOR THE GRINDERS AND MACHINE TOOLS OF TOMORROW

Indicator readings taken on the noses of thousands of POPE Super-Precision Spindles show less than one half of one ten thousandth (less than 50 millionths) of an inch of total eccentricity.

Whenever you want Precision Motorized or Belt Driven Spindles, in quantities of one, a hundred or more — whatever the kind of work you want to do — let us submit recommendations and estimates.

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Made in a complete range of standard A.G.D. sizes and 54 types, with English or Metric graduations.

STARRETT DIAL COMPARATOR No. 653

With fine vertical adjustment. Base platen 9" x 9⅝". Vertical capacity 9¼". Throat depth 5". Indicator graduated .001".

STARRETT PORTABLE DIAL HAND GAGES No. 1015-A and 1015-B

½" and 1" thickness capacities; 2½" throat. Ideal for quickly measuring plywood, rubber, textiles, paper, metal parts, leather, veneer, fabrics, etc.

STARRETT UNIVERAL DIAL BENCH GAGE No. 652

With sliding table and fine adjustment. Capacity 1¾", throat depth 1⅝". Indicator graduated .0005".

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TRADE MARK Starrett REG U S PAT OFF

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WORLD'S GREATEST TOOLMAKERS

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Athol, Massachusetts, U. S. A.

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS
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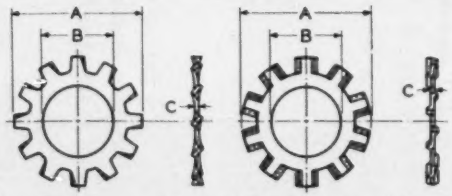
AMERICAN STANDARD EXTERNAL TOOTH LOCK WASHERS

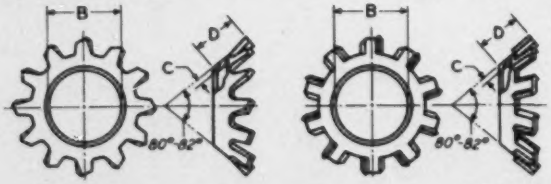


Type A — External Tooth Lock Washers — Type B

	Size	#2	#3	#4	#5	#6	#8	#10	#12	1/4	5/16	3/8
A	Max.	.....	.....	0.290	.....	0.320	0.381	0.410	0.475	0.510	0.610	0.694
	Min.	.....	.....	0.275	.....	0.305	0.365	0.395	0.460	0.494	0.588	0.670
B	Max.	.....	.....	0.123	.....	0.150	0.176	0.204	0.231	0.267	0.332	0.398
	Min.	.....	.....	0.115	.....	0.141	0.168	0.195	0.221	0.256	0.320	0.384
C	Max.	.....	.....	0.019	.....	0.022	0.023	0.025	0.028	0.028	0.034	0.040
	Min.	.....	.....	0.015	.....	0.016	0.018	0.020	0.023	0.023	0.028	0.032

	Size	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	1	1 1/8	1 1/4
A	Max.	0.760	0.900	0.985	1.070	1.155	1.260	1.315	1.410	1.620	.....	.....
	Min.	0.740	0.880	0.960	1.045	1.130	1.220	1.290	1.380	1.590	.....	.....
B	Max.	0.464	0.530	0.596	0.663	0.728	0.795	0.861	0.927	1.060	.....	.....
	Min.	0.448	0.513	0.576	0.641	0.704	0.768	0.833	0.897	1.025	.....	.....
C	Max.	0.040	0.045	0.045	0.050	0.050	0.055	0.055	0.060	0.067	.....	.....
	Min.	0.032	0.037	0.037	0.042	0.042	0.047	0.047	0.052	0.059	.....	.....

All dimensions are given in inches.



Type A — Countersunk External Tooth Lock Washers — Type B

	Size	#4	#6	#8	#10	#12	1/4	#16	5/16	3/8	7/16	1/2
B	Max.	0.123	0.150	0.177	0.205	0.231	0.267	0.287	0.333	0.398	0.463	0.529
	Min.	0.113	0.140	0.167	0.195	0.220	0.255	0.273	0.318	0.383	0.448	0.512
C	Max.	0.019	0.021	0.021	0.025	0.025	0.025	0.028	0.028	0.034	0.045	0.045
	Min.	0.015	0.017	0.017	0.020	0.020	0.020	0.023	0.023	0.028	0.037	0.037
D	Max.	0.065	0.092	0.105	0.099	0.128	0.128	0.147	0.192	0.255	0.270	0.304
	Min.	0.050	0.082	0.088	0.083	0.118	0.113	0.137	0.165	0.242	0.260	0.294
E*	Approx O.D.	0.213	0.289	0.322	0.354	0.421	0.454	0.585	0.599	0.765	0.867	0.976

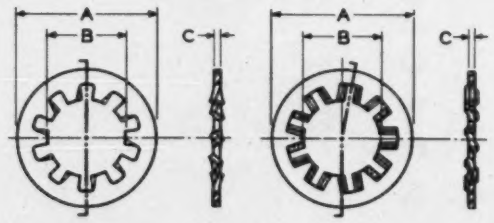
*For reference purposes only.

MACHINERY'S Data Sheet No. 724, February, 1953

Approved by American Standards Association as ASA B27.1

AMERICAN STANDARD INTERNAL TOOTH LOCK WASHERS

Internal Tooth



Type A — Type B

Internal Tooth Lock Washers

	Size	#2	#3	#4	#5	#6	#8	#10	#12	1/4	5/16	3/8
A	Max.	0.200	0.232	0.270	0.280	0.295	0.340	0.381	0.410	0.478	0.610	0.692
	Min.	0.175	0.215	0.255	0.245	0.275	0.325	0.365	0.394	0.460	0.594	0.670
B	Max.	0.095	0.109	0.123	0.126	0.150	0.176	0.204	0.231	0.267	0.332	0.398
	Min.	0.089	0.102	0.115	0.129	0.141	0.168	0.195	0.221	0.256	0.320	0.384
C	Max.	0.015	0.019	0.019	0.021	0.021	0.023	0.025	0.025	0.028	0.034	0.040
	Min.	0.010	0.012	0.015	0.017	0.017	0.018	0.020	0.020	0.023	0.028	0.032

	Size	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	1	1 1/8	1 1/4
A	Max.	0.789	0.900	0.985	1.071	1.166	1.245	1.315	1.410	1.637	1.830	1.975
	Min.	0.740	0.867	0.957	1.045	1.130	1.220	1.290	1.364	1.590	1.799	1.921
B	Max.	0.464	0.530	0.596	0.663	0.728	0.795	0.861	0.927	1.060	1.192	1.325
	Min.	0.448	0.512	0.576	0.640	0.704	0.769	0.832	0.894	1.019	1.144	1.275
C	Max.	0.040	0.045	0.045	0.050	0.050	0.055	0.055	0.060	0.067	0.067	0.067
	Min.	0.032	0.037	0.037	0.042	0.042	0.047	0.047	0.052	0.059	0.059	0.059

All dimensions are given in inches.

Heavy Internal-Tooth Lock Washers

	Size	1/4	5/16	3/8	7/16	1/2	9/16	5/8	3/4	7/8
A	Max.	0.536	0.607	0.748	0.858	0.924	1.034	1.135	1.265	1.447
	Min.	0.500	0.590	0.700	0.800	0.880	0.990	1.100	1.240	1.400
B	Max.	0.267	0.332	0.398	0.464	0.530	0.596	0.663	0.795	0.927
	Min.	0.256	0.320	0.384	0.448	0.512	0.576	0.640	0.768	0.894
C	Max.	0.045	0.050	0.050	0.067	0.067	0.067	0.067	0.084	0.084
	Min.	0.035	0.040	0.042	0.050	0.055	0.055	0.059	0.070	0.075

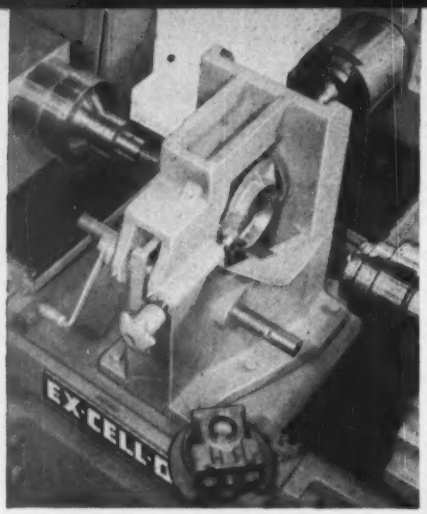
All dimensions are given in inches.

MACHINERY'S Data Sheet No. 723, February, 1953

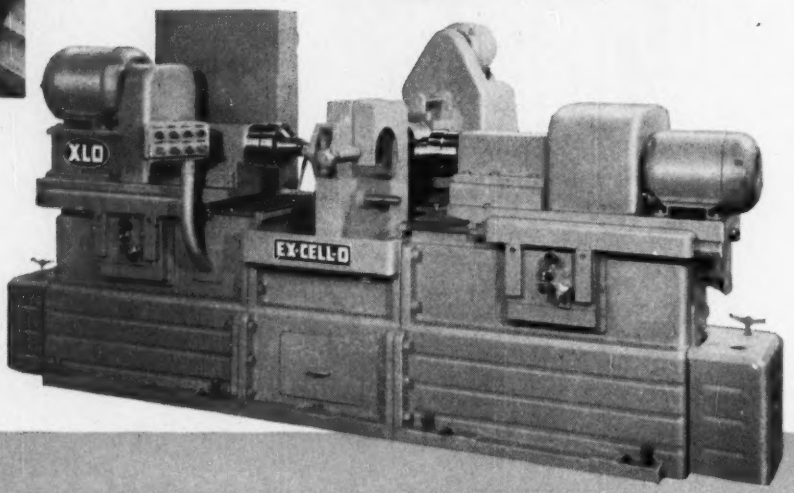
Approved by American Standards Association as ASA B27.1

Combine Operations

FOR PRECISION



Close-up view shows relatively simple tooling.



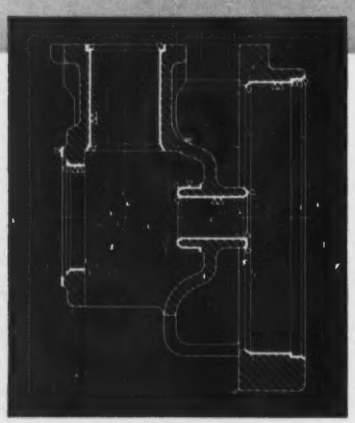
Ex-Cell-O Three-Way Precision Boring Machine.

COMBINING OPERATIONS CUTS COSTS, BOOSTS OUTPUT, PROMOTES ACCURACY

Once a part is properly located and clamped it's good practice to do as much machining on it as possible before it's moved. In this way the various operations can be held in accurate relationship to one another, production is increased, and handling time is minimized.

In machining this cast-iron refrigeration crankcase, five roughing and eighteen finishing operations are held in accurate relationship to one another, with extremely close tolerances on the crankshaft and cylinder bores. Net production for the roughing operation is 33 parts per hour; for finishing, 36 parts per hour.

Ask your local Ex-Cell-O representative about all the other advantages of Ex-Cell-O Way Machines, or write today for Bulletin 31631.



Sectional view with heavy lines to show operations. Single and double triangles indicate, respectively, single operation and rough-and-finish operations.

XLO

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DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS
DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

52-15

Coming Events

MARCH 17-20—Twenty-first annual meeting of the AMERICAN SOCIETY OF TOOL ENGINEERS to be held in Detroit at the Hotel Statler. For further information, write to Denham & Co., 925 Book Building, Detroit 26, Mich.

MARCH 23-27 — Eighth Western Metal Congress and Exposition sponsored by the AMERICAN SOCIETY FOR METALS, to be held in the Pan-Pacific Auditorium, Los Angeles, Calif. Secretary, W. H. Eisenman, 7301 Euclid Ave., Cleveland 3, Ohio.

MARCH 25-27—National Production Meeting sponsored by the SOCIETY OF AUTOMOTIVE ENGINEERS to be held at the Hotel Statler, Cleveland, Ohio. For further information contact D. S. Kimball, Jr., general manager of Bendix-Westinghouse Automotive Air Brake Co., Elyria, Ohio.

MARCH 31-APRIL 2 — First International Magnesium Exposition of the MAGNESIUM ASSOCIATION, at the Washington National Guard Armory, Washington, D. C. Further information can be obtained by addressing the Association at 122 E. 42nd St., New York 17, N. Y.

APRIL 20-22—METAL POWDER SHOW AND NINTH ANNUAL MEETING sponsored by the Metal Powder Association, to be held at the Hotel Cleveland, Cleveland, Ohio. For further information, write to the Association, 420 Lexington Ave., New York 17, N. Y.

APRIL 27-MAY 8 — BRITISH INDUSTRIES FAIR at Earls Court and Olympia, London, and Castle Bromwich, Birmingham, England. For further information, contact British Information Services, 30 Rockefeller Plaza, New York 20, N. Y.

MAY 18-22—FIFTH NATIONAL MATERIALS HANDLING EXPOSITION sponsored by the Materials Handling Institute, to be held at Convention Hall, Philadelphia, Pa. For further information, write to Clapp & Poliak, Inc., 341 Madison Ave., New York 17.

JUNE 16-19—National Spring Technical Meeting and Welding and Allied Industry Exposition of the AMERICAN WELDING SOCIETY at the Shamrock Hotel, Houston, Tex. Executive secretary, J. G. Magrath, 33 W. 39th St., New York 18, N. Y.

Motion Pictures Increase Efficiency at the Consolidated Vultee Aircraft Corporation

Motion pictures of fabrication and assembly departments, final assembly lines, offices, and exterior plant areas in operation are increasing production efficiency at the San Diego, Calif., Division of the Consolidated Vultee Aircraft Corporation. Like football coaches reviewing films of a game, the Convair production group detects conditions which need correction by analyzing departments in operation from advantageous camera locations. The photographic facilities permit up-to-the-minute shots throughout various areas of the plant and the viewing of films within a few hours.

All of Convair's major assembly buildings are equipped with overhead cranes. The perspective of departments from crane levels has proved to be most effective in planning production improvements. Although most of the scenes are taken from cranes, many shots are obtained from balconies, ground positions, roof tops, and a few have been taken from a camera plane. Narrated by division executives, the films are shown from a reversible projector. This permits careful study and discussion of problems exposed by the camera.

Footage of various departments obtained during working hours has uncovered some unsafe practices that had previously escaped the attention of individual observers. Focussing attention on work methods, the films reveal instances where employes are holding parts which should be held in fixtures. Crowded or sparsely filled work stations can be recorded from levels which give a better over-all view of departments in operation. Congested transportation inside and outside of buildings and inefficient materials handling practices have been improved.

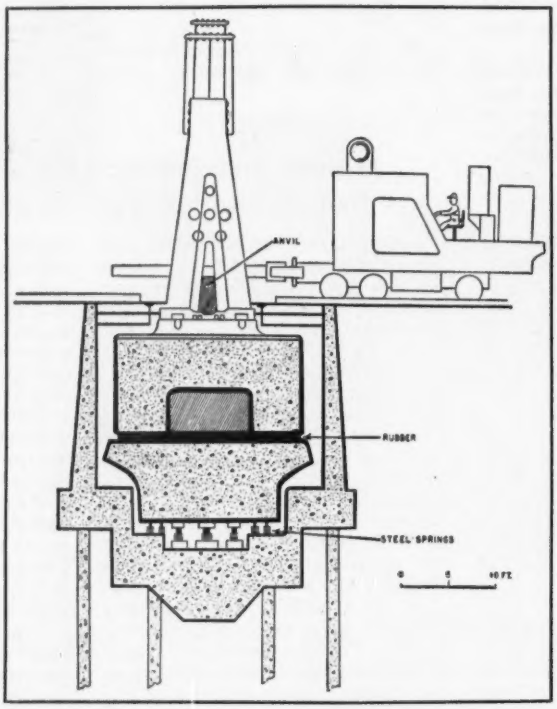
A typical scene taken from a balcony in Convair's San Diego plant is shown here. Such a scene permits careful study of work stations and labor distribution.

Unique Foundation Isolates Vibrations of Steam Hammer

Vibrations of a large steam-operated forging hammer installed at the Huntington Works of the International Nickel Co. have been isolated by mounting it on a unique spring-supported concrete foundation. As a result of this unusual installation, maintenance costs throughout the plant have been reduced due to the elimination of ground vibration, and production has been increased. The hammer recently forged its 15,000th ingot, making a total production of 75,000,000 pounds of Inco nickel and nickel alloys.

The hammer, weighing 521 tons, literally floats on the concrete raft in a concrete basin. As shown in the illustration, the legs and anvil of the hammer are bolted to a concrete base 21 feet long, 18 feet wide, and 10 feet thick. This base rides on a rubber cushion which is supported by a second concrete block of similar size. The rubber is of a special type, bonded on each side to a steel plate.

The bottom of the lower concrete block rides on 432 steel coil springs that are mounted on a concrete floor supported by cement piles. The foundation, from the top of the uppermost concrete block to the bottom of the pillars, extends 40 feet below the floor of the forge shop. The foundation represents a joint development by J. H. A. Crockett, London, England, the designer; Robert W. Hunt Co., New York City, who had technical supervision of the construction; the engineering staff of the Huntington Works; and various technical consultants in this country and abroad.



Simplified drawing of a unique foundation employed to isolate vibrations of a steam-operated forging hammer

Airplane Engines "Canned" for Overseas Shipment

The United States Air Force uses the world's largest "cans" to pack airplane engines for overseas. The cans are made of 11- or 12-gage low-carbon, hot-rolled steel plates. Although they cost more than wooden crates, they are less expensive in the long run as they can be reused.

The engine cans are made in two sections, and flanged so that the two can be bolted together. Humidity is eliminated by placing moisture-absorbing desiccant inside the cans before they are closed. After the two halves are bolted together, dehydrated air is pumped in through a special valve and then the valve opening is sealed.

The steel cans solve still another problem, that of shock during shipment. An elaborate mounting developed by Air Force engineers guards the engine against all forms of vibration. The canned engines are so thoroughly protected that they can be dropped, rolled over, and even dunked in the ocean without damage.

Mobile Gage Testing Laboratory

A mobile gage testing laboratory was recently put into operation at the Evans Products Co., Plymouth, Mich. The new laboratory, designed and built for the Detroit Ordnance District, brings testing facilities to industrial plants serving the District, rather than making it necessary for plant production men to take gages to a central laboratory for testing.

It is planned that the mobile laboratory, housed in a 28-foot trailer, will make periodic visits to supplier plants throughout the area served by the Detroit Ordnance District. It will spend about a week at each major plant, and its facilities will also be made available to smaller defense plants in the area.

Weighing slightly under 5 tons, the trailer carries a three-man crew of technicians. Equipped with its own heating and air conditioning systems, the mobile laboratory can operate on electrical power from any plant it visits.

Inside the trailer are waist-high work counters, storage cabinets, and recessed lights. More than eighty small tools used in checking gages are stored in cabinets when not in use. Larger pieces of equipment—including an Eastman contour projector, a Pratt & Whitney universal measuring machine, three granite surface plates, a Supermicrometer, and an internal measuring machine—are mounted on counters.

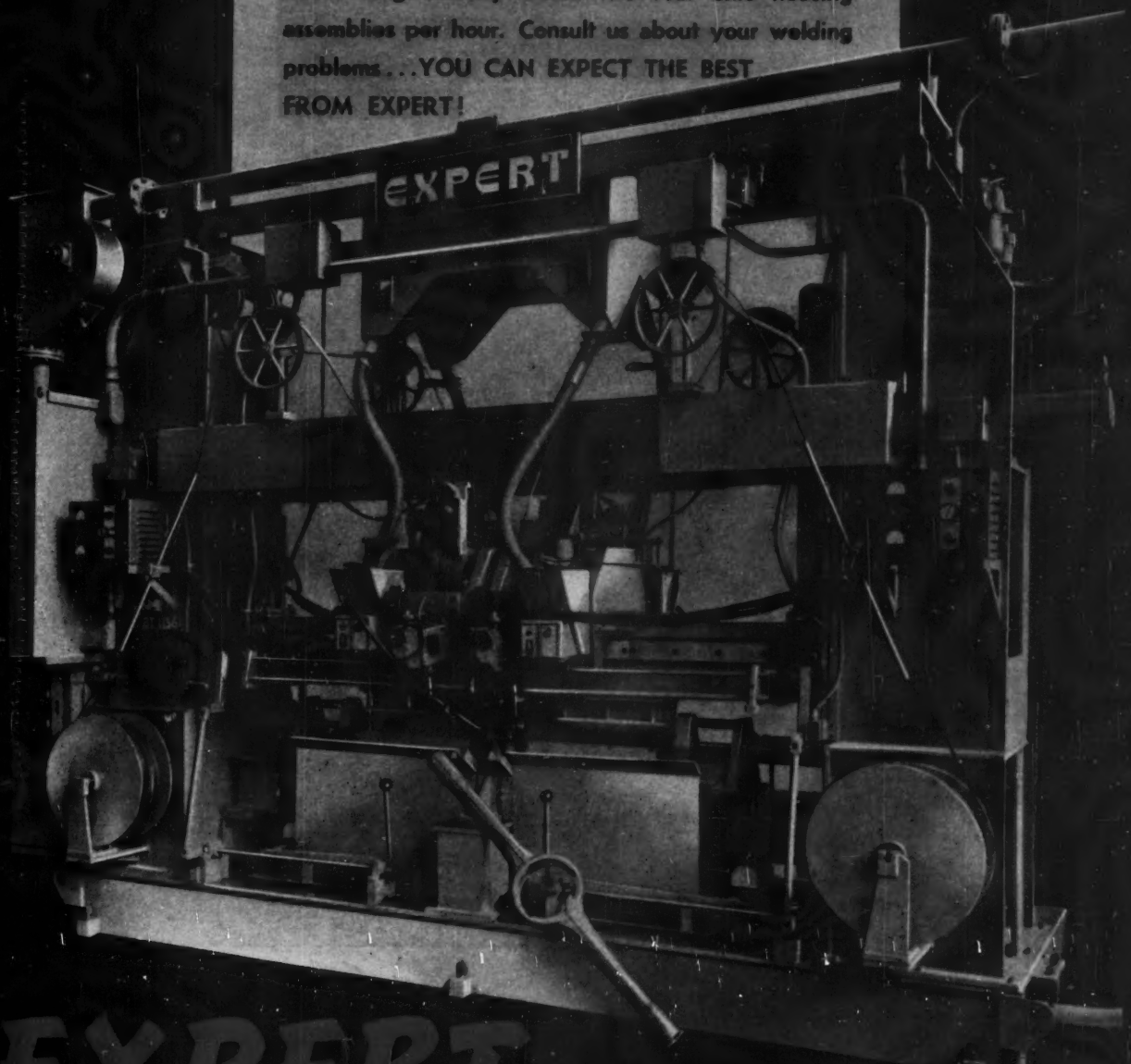
* * *

Machine Tool Production

Machine tools having a value of $630,000,000 were shipped by 387 companies during 1951, according to the Bureau of the Census, Department of Commerce. These shipments were approximately double the value of machine tools shipped during 1950.

YOU CAN EXPECT THE BEST FROM EXPERT!

For controlled welding, this Automatic Submerged Arc Welder with four welding heads longitudinally welds 120 rear axle housing assemblies per hour. Consult us about your welding problems . . . YOU CAN EXPECT THE BEST FROM EXPERT!



EXPERT

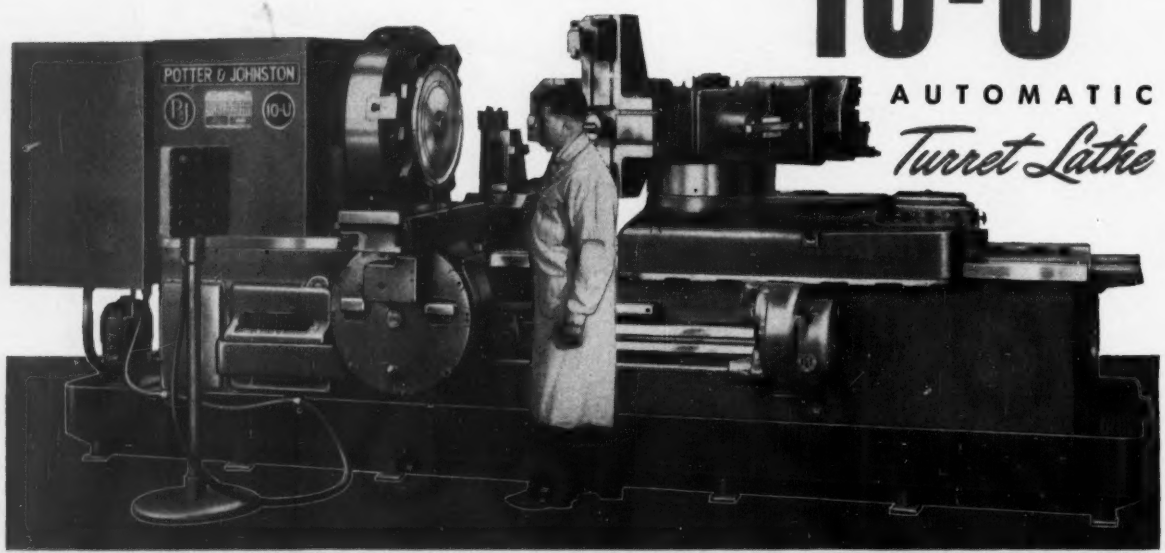
WELDING MACHINE COMPANY

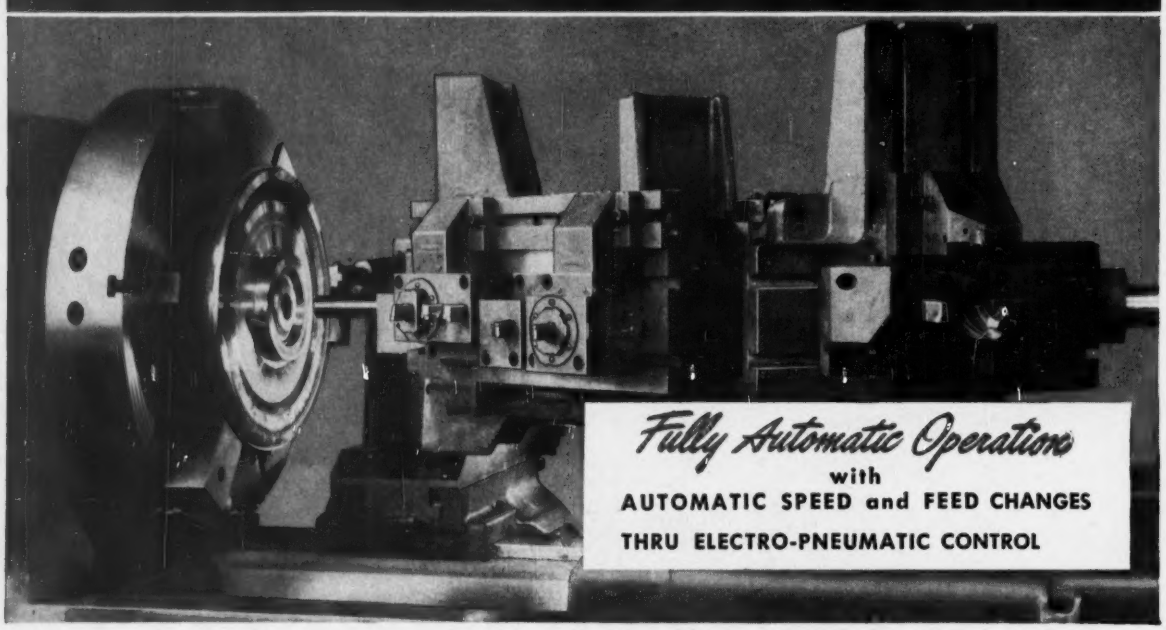
17144 Mt. Elliott Detroit 12, Michigan

HANDLE YOUR BIG JOBS WITH NEW *SPEED* AND *ECONOMY* ON THE POTTER & JOHNSTON 10-U

AUTOMATIC

Turret Lathe





Fully Automatic Operations
with
AUTOMATIC SPEED and FEED CHANGES
THRU ELECTRO-PNEUMATIC CONTROL

New Productivity

in the manufacture of . . .

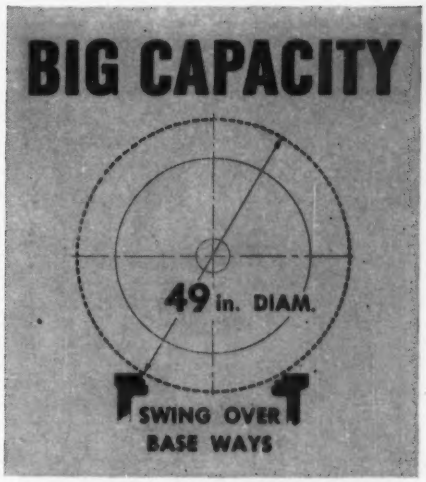
- AGRICULTURAL, EARTH MOVING AND AUTOMOTIVE EQUIPMENT
- AVIATION JET ENGINES
- BIG ELECTRICAL MOTORS
- ORDNANCE COMPONENTS

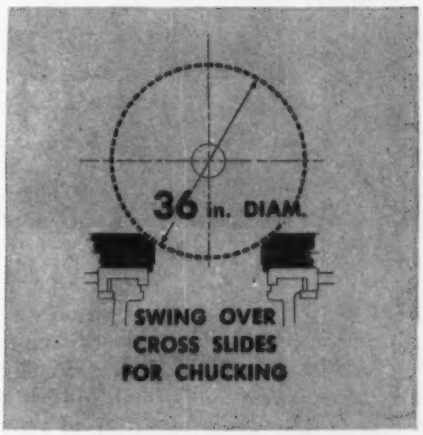
. . . AND ALL LARGE CHUCKING WORK

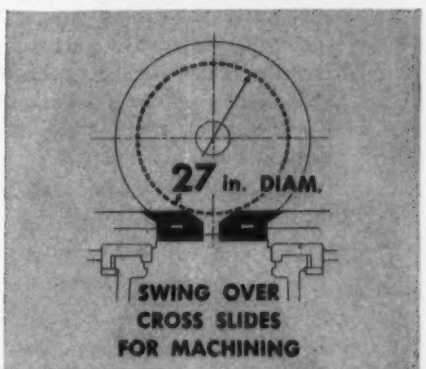
The big, powerful, new Potter & Johnston 10-U Turret Lathe now brings the advantages of fully automatic operation to your really big, hard-to-handle jobs, like this large-diameter disk for an aircraft jet engine—shown here mounted in a 36 inch chuck. The P&J-designed tooling takes full advantage of simultaneous multiple cuts to produce the finished work piece.

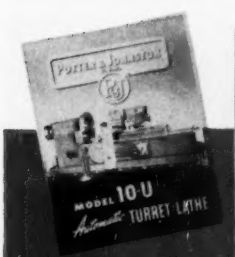
The P&J 10-U is equipped with a 75 horsepower motor, multi V-belt drive and air operated chucks. Controls are centralized in a single, convenient station. All mechanisms including the clutches are readily accessible for adjustment.

If you're doing big jobs, you'll want more information on the Potter & Johnston 10-U Automatic Turret Lathe. Send today for your copy of Bulletin 146. Write on your Company letterhead to the Pratt & Whitney Branch Office nearest you — or direct to Pawtucket, R. I.









POTTER & JOHNSTON CO.
PAWTUCKET, RHODE ISLAND
SUBSIDIARY OF
PRATT & WHITNEY
DIVISION NILES – BEMENT – POND COMPANY

WRITE DIRECT OR CONTACT THE PRATT & WHITNEY BRANCH OFFICE NEAREST YOU
BIRMINGHAM • BOSTON • CHICAGO • CINCINNATI • CLEVELAND • DETROIT • LOS ANGELES • NEW YORK • PHILADELPHIA • PITTSBURGH • ROCHESTER • SAN FRANCISCO • ST. LOUIS • EXPORT DEPT., WEST HARTFORD

WHAT'S YOUR PRESSING PROBLEM?

FORMING AND DRAWING

FORGING

PLATE WORKING

GENERAL

POWDER METALLURGY

No matter what your performance or size requirement, you can get exactly the press you need at Baldwin. If you need a standard press, there's a complete line of Baldwin hydraulic presses for high speed production of practically any metal part. *But more than that,* we have the unusual long-time experience, the big machine tools and other facilities to tailor-make a press to exactly fit your specifications—even if you want a six-story press like the one we are now making for a prominent southwestern manufacturer.

If you have a pressing problem of any kind—call today. Or write for Bulletin 285 describing a few of the metal-working presses made by Baldwin-Lima-Hamilton.

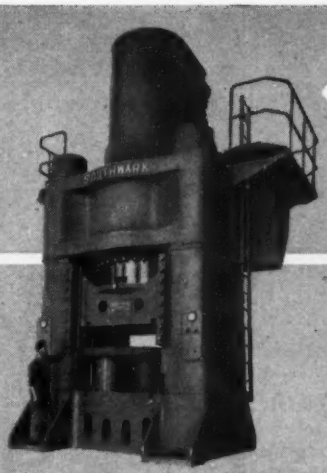
But not just big presses...

It's true that Baldwin makes some of the largest presses built in this country. However, we are also builders of the largest variety of small and medium-sized presses for every conceivable need. Typical are these tiny table presses for straightening metal parts.

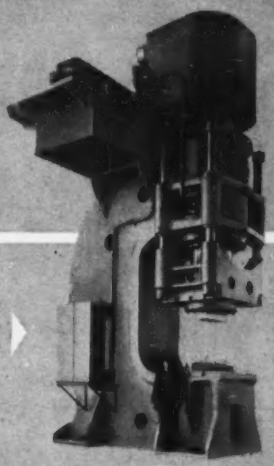
REMEMBER: At Baldwin you can get one-source responsibility for all your presses from the very largest to the smallest.

EDDYSTONE DIVISION
PHILADELPHIA 42, PA.

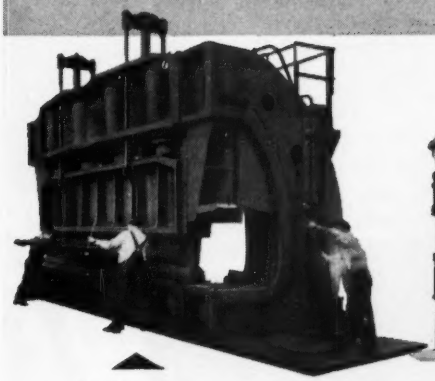
BALDWIN -



Baldwin offers forming and drawing presses in sizes from 150 ton to even larger than this 4000 ton press for forming stainless steel parts.

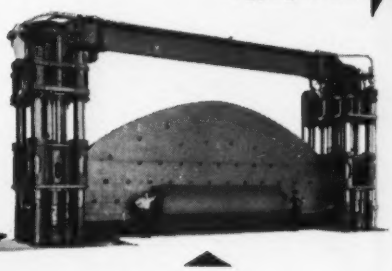


Whether designed for working down hot billets or for forging metal to exact shapes, Baldwin forging presses are famed for unusual accuracy . . . unusual flexibility.

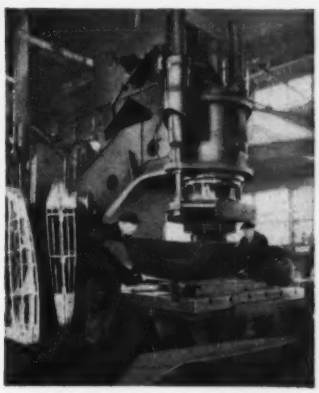


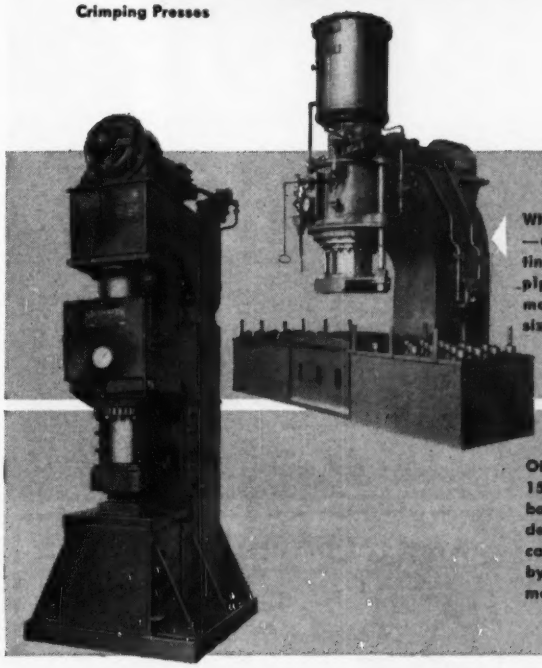
Crimping Presses

Joggling Presses



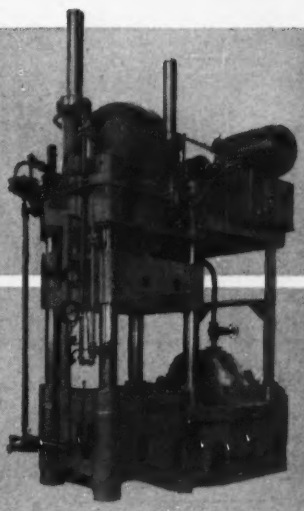
Bending Presses





Whatever your general press needs —utility, straightening, die-spotting, sizing, bulldozing, bushing, pipe-bending, others—Baldwin makes them in the widest range of sizes and pressures.

Offered in pressure ranges from 150 to 3000 tons for producing bars or finished products from powdered metals, these Baldwin presses can cut your manufacturing costs by eliminating many expensive machining operations.



BALDWIN-LIMA-HAMILTON CORPORATION

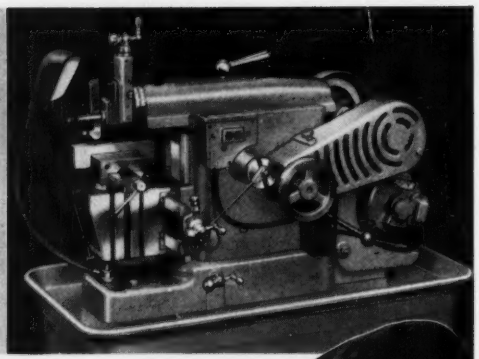
OFFICES IN PRINCIPAL CITIES

LIMA-HAMILTON

BALDWIN BLH LIMA-HAMILTON

South Bend 7" Shaper

FAST · EFFICIENT · ECONOMICAL!



Watch your machining costs on small work go down when a South Bend 7" Shaper takes over.

FIRST, its speed — 42 to 195 strokes per minute reduces machining time.

SECOND, its 7" stroke will handle a good share of your small toolroom, maintenance and production jobs thus releasing your heavy shapers for larger work. This stops the waste of using excess machine capacity on small jobs.

THIRD, with its small initial cost, less power consumption and low upkeep expense, your equipment budget won't take a beating when you specify South Bend 7" Shapers. Find out how these fast, versatile shapers can save you money. Call your local South Bend distributor today or send the coupon for complete information.

SPECIFICATIONS

RAM

Stroke length . . . . . 0 to 7"
Strokes per min. (4) . . . 42 to 195
Cutting speeds . . . 3 to 114 feet per minute

TOOL HEAD

Vertical travel . . . . . 3"
Tool post slot . . . . . ⅜" x ⅞"
Head swivels . . . . . 360°
Clapper swivels . . . . . 35°

TABLE

Vertical travel . . . . . 5"
Horizontal travel . . . . . 9½"
Power cross feeds (6) . . . . . .002" to .012" (reversible)
Size . . . . . 6¾" x 5" x 5⅜"
Distance from ram . . . ½" to 5½"

VISE

Maximum opening . . . . . 4"
Jaw width . . . . . 4"
Jaw depth . . . . . 1"
Height over table . . . . . 2 11/16"

MOTOR

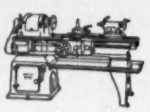
⅓ or ½ h.p.

SEND INFORMATION CHECKED:

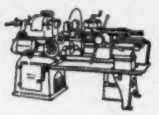
☐ _____

☐ TOOLS & ATTACHMENTS

☐ 9" and 10" BENCH LATHES

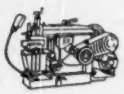


☐ 10" to 16-24" FLOOR LATHES



☐ ½" and 1" Collet TURRET LATHES

☐ 14" DRILL PRESSES



☐ 7" BENCH SHAPERS

Name _____ Company _____

Street _____ City & State _____

Building Better Tools Since 1906 · **SOUTH BEND LATHE** · South Bend 22, Indiana

"We solve depth-of-hardness problems on low hardenability steels with GULF SUPER-QUENCH"

says James Mericka, President
Steel Improvement Co., Detroit, Mich.

"One of our current jobs is quenching and drawing 1¼ x 22 in. cold-rolled pins for tank tractor treads," says Mr. Mericka, "and we have to through-harden these pins to 35-40 Rockwell C. Ordinarily this is quite a problem with some of the substitute steels, such as AISI 8150 and 8160."

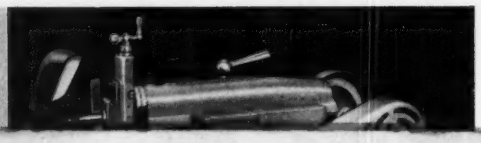
"But by using Gulf Super-Quench, we've been able to meet this hardness specification on every substitute steel delivered to us. And we get a minimum of distortion and cracking with this fast-quenching oil, which results in fewer rejects and an improved profit picture."

This is typical of the results obtained in scores of metal-working plants with Gulf Super-Quench. For additional information on this quality fast-quenching oil, call in a Gulf Sales Engineer. Write, wire, or phone your nearest Gulf office.

GULF OIL CORPORATION
GULF REFINING COMPANY
PITTSBURGH 30, PENNSYLVANIA

GULF SERVES INDUSTRY

South Bend 7" Shaper



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ECONOMICAL!

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MOTOR

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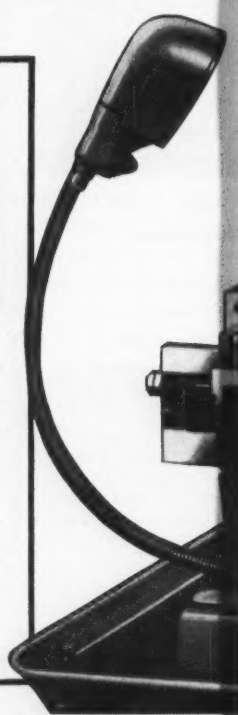

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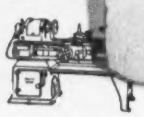

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☐ TOOLS & ATTACHMENTS ☐ 9" and 10" BENCH LATHES ☐ 10" to 16-24" FLOOR LATHES ☐ ½" and 1" Collet TURRET LATHES ☐ 14" DRILL PRESSES ☐ 7" BENCH SHAPERS

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AGES

SSING

GULF SERVES INDUSTRY

South Bend 7" Shaper

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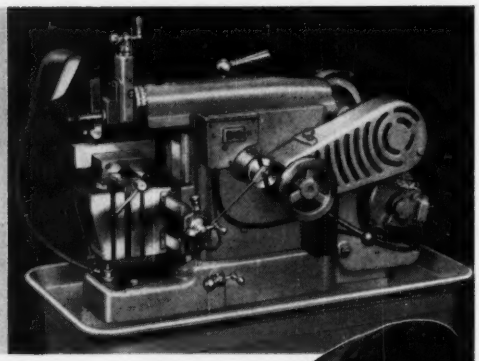

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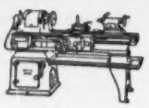

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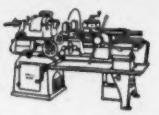

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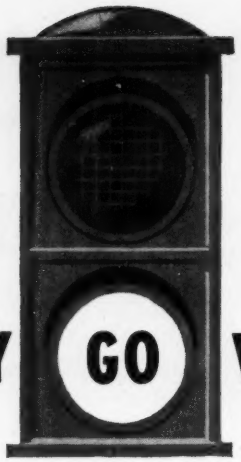
GULF OIL CORPORATION
GULF REFINING COMPANY
PITTSBURGH 30, PENNSYLVANIA

GULF SERVES INDUSTRY

One of the major factors contributing to long tool life and better stamping is the working alignment of tools. This fundamental principle was recognized in the first V & O press. For more than 60 years the V & O long slide design has been preferred when tooling is costly.

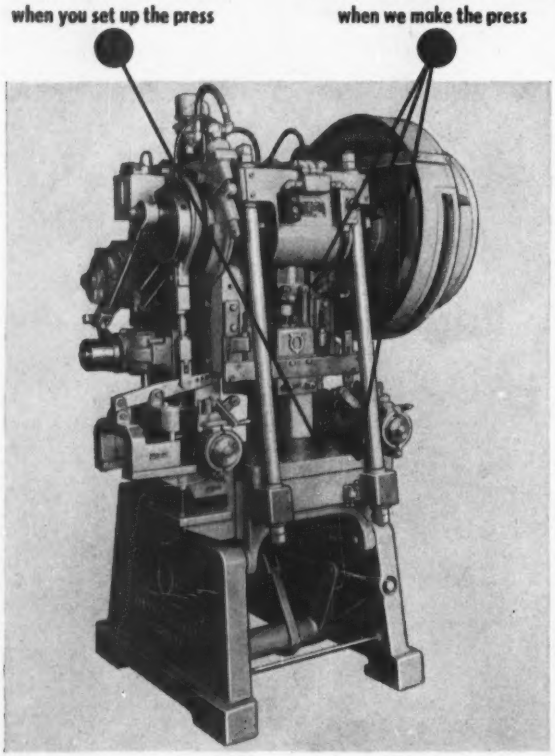


WHEN TOOLING IS COSTLY GO V&O

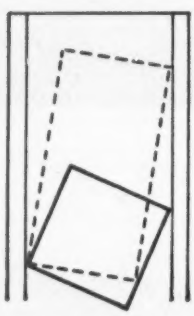
WORKING ALIGNMENT DEPENDS ON

WHAT YOU DO HERE
when you set up the press

AND WHAT WE DO HERE
when we make the press



More room to attach tools, controls, moving members, too



WHY THE V & O LONG SLIDE PROVIDES BETTER ALIGNMENT

With the same running clearance, the longer the slide, the less possibility for angular misalignment.

WORKING ALIGNMENT depends upon properly aligned tools *STAYING* aligned throughout the power stroke. Simple geometry will show that the long slides on V & O Presses minimize the possibilities of the tools being forced out of line. The superior workmanship and accuracy of V & O Presses supplement this long slide principle. This is especially important on long strokes. The longer the stroke the greater the superiority of the V & O long slide principle.

ASK OUR DISTRIBUTORS FOR LITERATURE

WE ARE PROUD OF THE MEN WHO REPRESENT US

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Arthur B. Gangloff Machinery
Columbus, Ohio

C. C. Garrett Machinery
Indianapolis, Indiana

C. O. Hanson Company
Minneapolis, Minnesota

C. J. Harter Machinery Company
Dallas, Texas
Houston, Texas

Mailler-Searles, Inc.
San Francisco, California

Rudel Machinery Company, Inc.
Boston, Massachusetts
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West Hartford, Connecticut

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Pittsburgh, Pennsylvania
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Charles A. Strelinger Company
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V & O REPRESENTATIVES IN CANADA

Rudel Machinery Company, Ltd.
Montreal, P. Q. Toronto, Ontario
Windsor, Ontario

THE V & O PRESS COMPANY
Division of Emhart Mfg. Co.

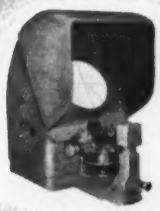
BUILDERS OF PRECISION POWER PRESSES AND FEEDS SINCE 1889

HUDSON NEW YORK

11 MODELS

3 SCREEN SIZES

Pedestal Type
14" Diam. Screen



Bench Type
14" Diam. Screen
4 Models

Bench Type
5¾" x 7¾" Screen
3 Models

Unsurpassed Inspection Versatility

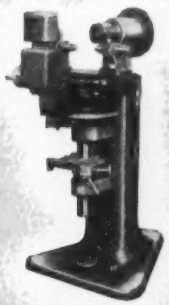
JONES & LAMSON OPTICAL COMPARATORS

The Essence of Quality Control

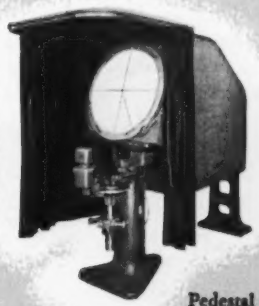
Jones & Lamson Optical Comparators are designed and built like rugged machine tools to withstand vibration and hard use. Yet they have the built-in accuracy to satisfy the most exacting laboratory standards.

- **They meet** the requirements of toolroom, laboratory and production inspection.
- **They precisely measure** height, depth, lead or spacing, as well as angles to degrees and minutes. They will measure to .0001".
- **They compare** intricately contoured parts with a master outline—and measure the amount of error.
- **They are convenient** to operate, easy to set up and read direct—*without computation.*
- **They operate** under normal lighting conditions. *No darkroom is needed.*
- **They will photograph** the enlarged shadow and record its relationship to a master chart.
- **Several persons** may study the shadow *at the same time.*
- **They will inspect** and measure surface contours, as well as profiles of objects such as type faces, stamping dies, punches, worn tools, etc.

Vertical Type
14" Diam. Screen



Direct
Projection
Type



Pedestal Type
30" Diam. Screen

P.S. A complete line of STANDARD CHARTS and FIXTURES is maintained by us.

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE COMPANY
512 Clinton St., Springfield, Vt., U.S.A.

J&L

COMPARATOR DIV.
Dept. 710

Jones & Lamson Machine Company
512 Clinton Street, Dept. 710
Springfield, Vermont, U. S. A.
Please send Comparator Catalog No. 402.

NAME_____ TITLE_____

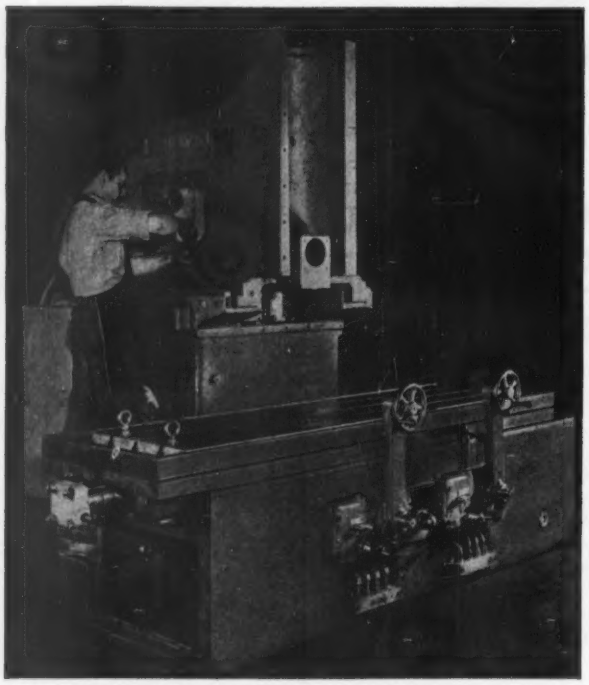
COMPANY_____

STREET_____

CITY_____ STATE_____

Engineered Rebuilding

How Simmons Methods Increase Machine Tool Output and Efficiency



Mechanical and hydraulic controls on both table and ram make rebuilding this Hydro-Tel a complex job. Valves must seat perfectly; adjustments are exceptionally precise.

Main spindle bearings are checked for runout and eccentricity. All bearings are tested and replaced if not up to standard. New bearings, used as replacement, are also tested prior to installation.

Complex Hydro-Tel completely rebuilt in twelve weeks

A manufacturer of dies, faced with the need for increasing production, learned that new machine tool deliveries meant a year's wait. So instead of waiting, he asked Simmons engineers to rebuild a veteran 16-inch Hydro-Tel.

Simmons stripped it down to the bare castings, cleaned it, and replaced worn parts and refinished sliding surfaces. They rebuilt its entire hydraulic-mechanical control system to the specifications of the original manufacturer. Seating the hydraulic valves and adjusting the hydraulic controls called for precision of the highest order.

From start to finish, the job was completed in 12 weeks. And now the machine is back in service, performing satisfactorily. In fact, the manufacturer has since sent Simmons a second Hydro-Tel, which is currently being rebuilt.

Will rebuilding work for you? It's easy to find out: simply send a list of your machines that might be rebuilt to meet new problems. We'll promptly quote prices and deliveries and send you our quarterly, "The Simmons Way."

SIMMONS MACHINE TOOL CORPORATION
1600 North Broadway, Albany 1, N. Y.

SIMMONS GIVES USED MACHINE TOOLS A NEW LEASE ON LIFE

Use WELDED STEEL for Greater Strength with Less Weight!

Above is another excellent example of Mahon versatility in the production of Steel-Weld Fabricated units for many industries. This base, undergoing machining operations, was produced for a TV picture tube manufacturer in the glass Industry... it is typical of thousands of Steel-Weld Fabricated parts and assemblies produced and machined by the Mahon Company for manufacturers throughout the country. If parts or assemblies in your product could be redesigned and produced to better advantage through Steel-Weld Fabrication, or, if you are faced with a limited production of a product involving heavy pieces in which pattern costs are a consideration, you can turn to Mahon with complete confidence. You will find in the Mahon organization a unique source with complete, modern fabricating, machining and handling equipment to cope with any type of work regardless of size or weight . . . a source where skillful designing and advanced fabricating technique are supplemented by craftsmanship which assures you a smoother, finer appearing job, embodying every advantage of Steel-Weld Fabrication.

THE R. C. MAHON COMPANY
DETROIT 34, MICHIGAN

Engineers and Fabricators of Steel in Any Form for Any Purpose

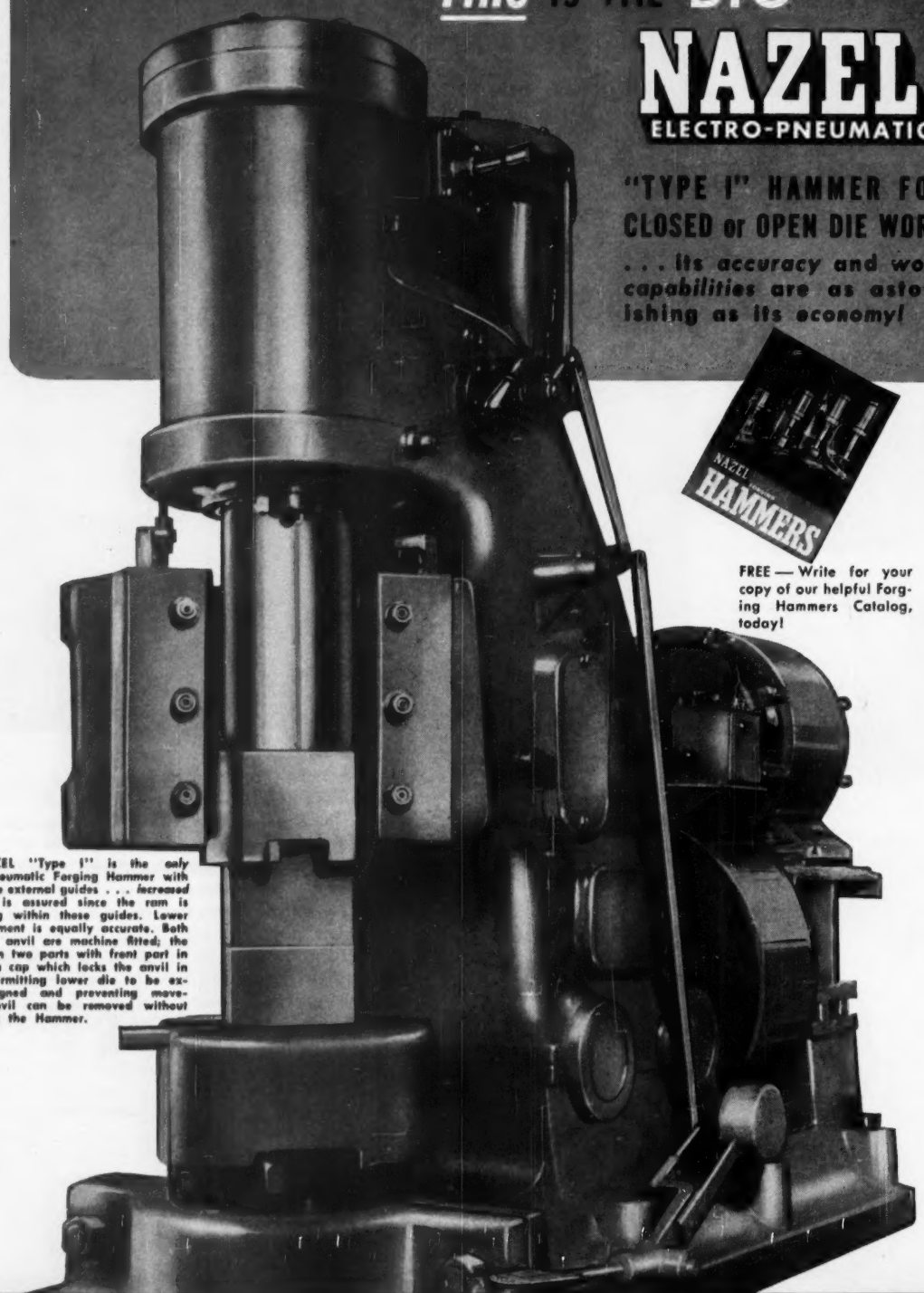
MAHON

This IS THE BIG NAZEL ELECTRO-PNEUMATIC

"TYPE I" HAMMER FOR CLOSED or OPEN DIE WORK

. . . its *accuracy* and *work capabilities* are as astonishing as its *economy!*

FREE — Write for your copy of our helpful Forging Hammers Catalog, today!

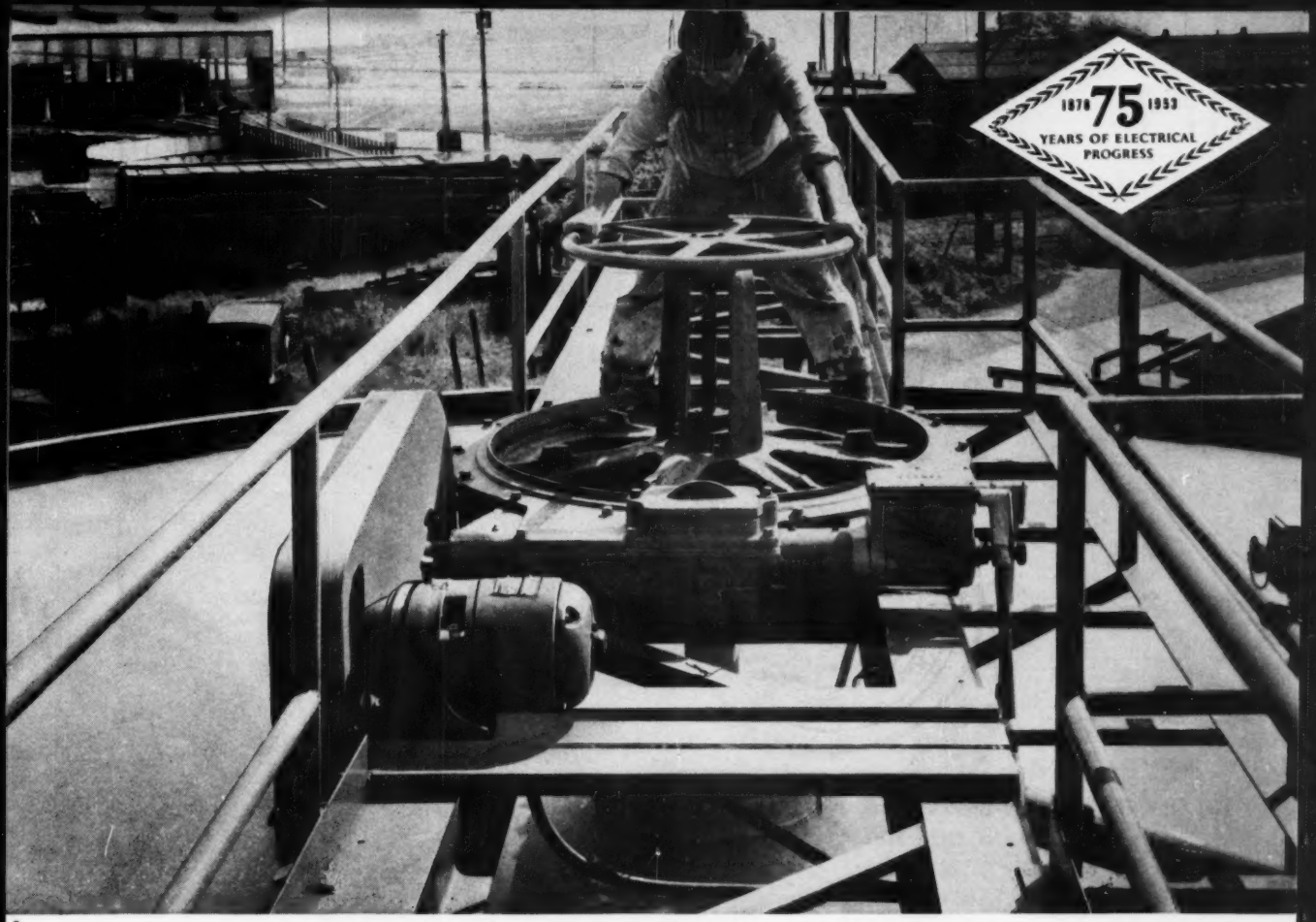


The NAZEL "Type I" is the only Electro-Pneumatic Forging Hammer with adjustable external guides . . . *increased* accuracy is assured since the ram is held snug within these guides. Lower die alignment is equally accurate. Both base and anvil are machine fitted; the base is in two parts with front part in form of a cap which locks the anvil in place, permitting lower die to be exactly aligned and preventing movement. Anvil can be removed without disturbing the Hammer.

1836 **LOBDELL UNITED COMPANY** 1953

WILMINGTON 99, DELAWARE

A SUBSIDIARY OF UNITED ENGINEERING AND FOUNDRY COMPANY



THIS G-E GEAR-MOTOR WAS PICKED TO RUN A SLUDGE ACCUMULATOR 24 HOURS A DAY AND 7 DAYS A WEEK BECAUSE . . .

New G-E Gear-motor Reduces "Down-time"

Easy stator removal, use of Tri-Clad* motors, cuts maintenance costs and time more than 50%.

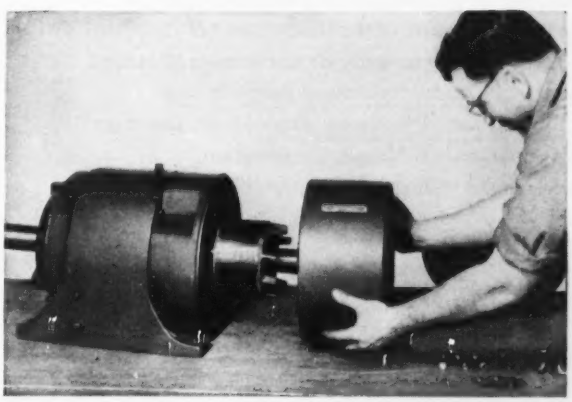
G-E Gear-motors are single units—compact and efficient—the most economical method of gear reduction for low-speed drives. This year, they have been redesigned to offer you additional operating economy.

EASY STATOR REMOVAL is now possible without disturbing the gear-train in any way. Also, any standard G-E motor—with or without feet—may be used as a stator replacement. These advantages mean a reduction of non-productive "down-time"—and substantial cost savings!

TRI-CLAD MOTORS are now an integral part of every G-E Gear-motor. These are the same motors which have gained such a wide acceptance throughout industry—the motors which assure you of extra reliability—triple protection against physical damage, electrical breakdown, and operating wear and tear.

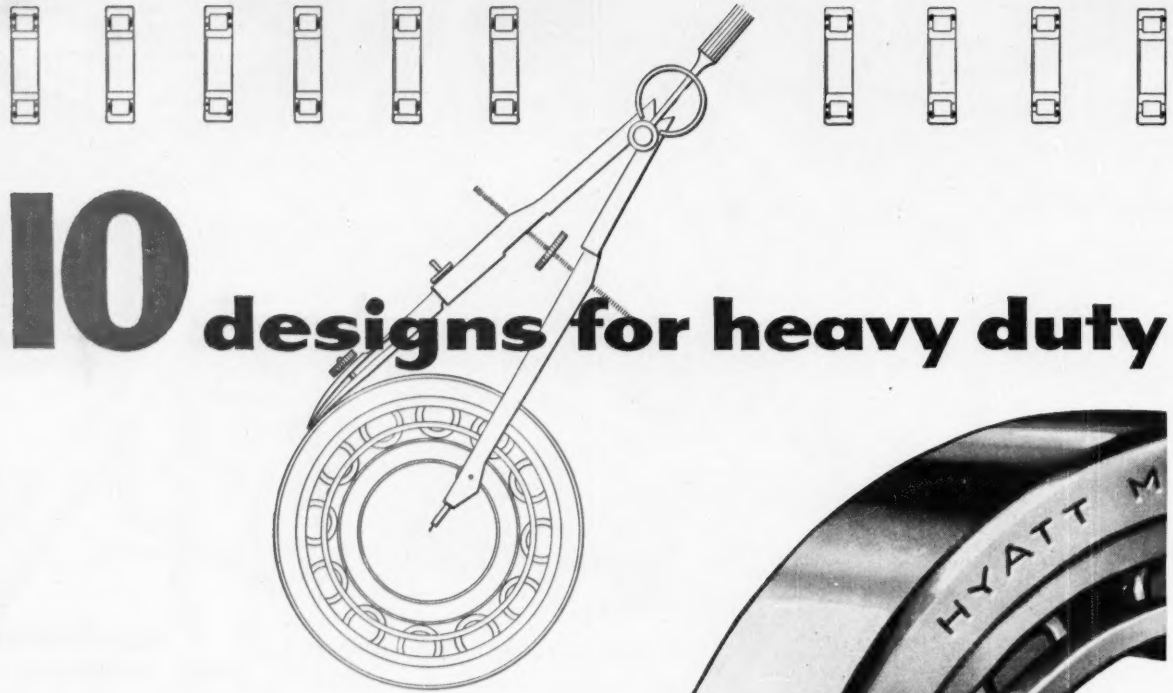
A new stocking plan keeps most popular ratings available on a 1-week basis. You can order your gear-motor from your nearest G-E Apparatus Sales Office or your Authorized G-E Agent or Distributor. General Electric Company, Schenectady 5, N. Y. 755-10

Registered Trade-mark of General Electric Company

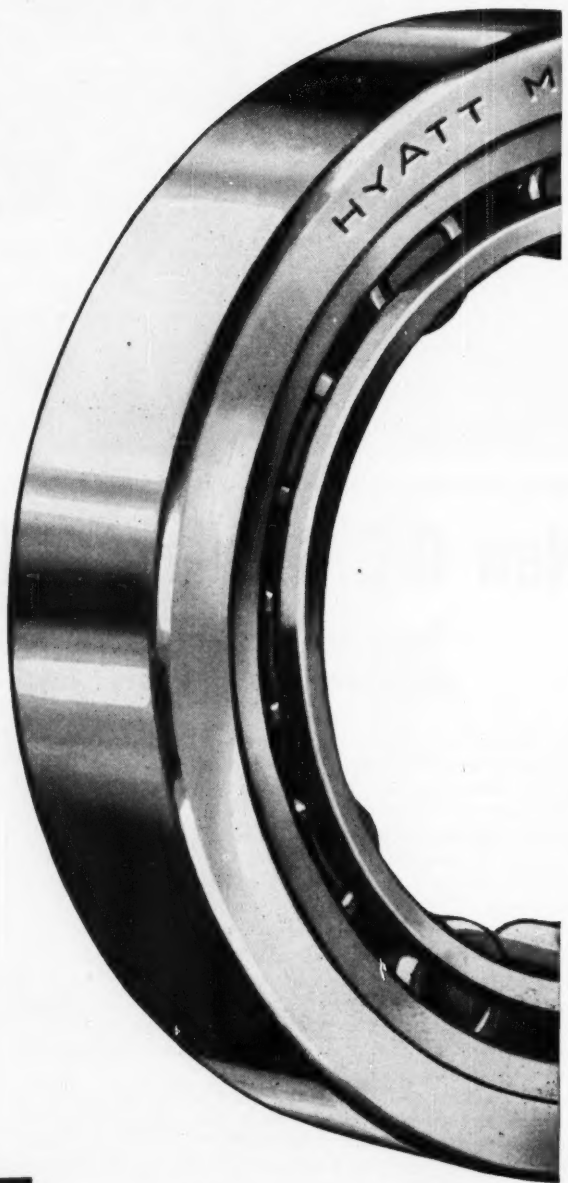


Rabbet fit between stator and gear-motor frame assures positive realignment. Note that stator removal is simply a matter of removing a few bolts—can be done without disturbing gear-train.

GENERAL ELECTRIC



10 designs for heavy duty

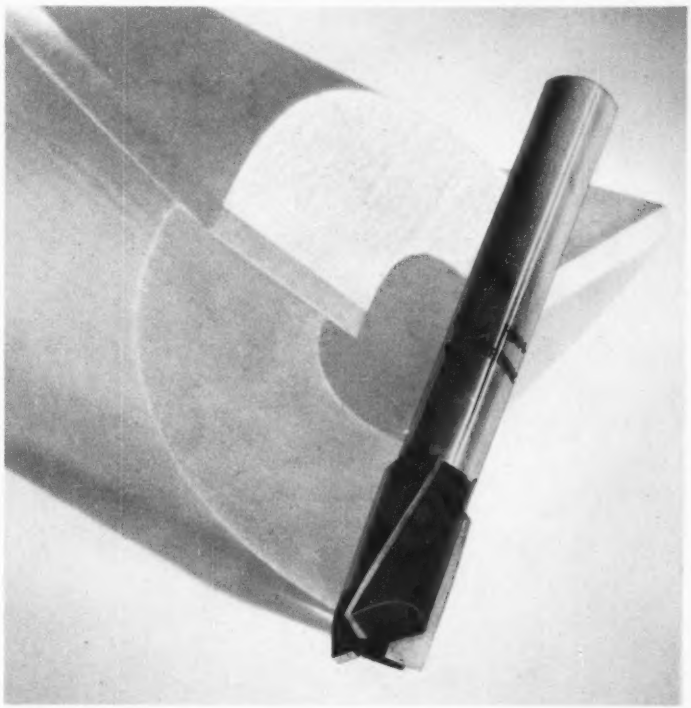


Ten different Hyatt Hy-Load designs, each in a variety of widths and sizes, assure you the right bearing for every radial need.
Four Hy-Load designs have separable inner races, two have separable outer races and four are non-separable. All are high-capacity, cylindrical roller bearings for the heaviest radial loads and light or intermittent thrust loads.
All separable parts are freely interchangeable within the same size. This permits non-selective fitting after pre-assembling the two bearing parts in separable machine elements.
Whatever your radial load problem, Hyatt Hy-Loads or some of the other types of Hyatt bearings can provide the answer. Because Hyatt offers industry's most complete line of straight radial roller bearings. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

HYATT ROLLER BEARINGS

New Counterbore

with interchangeable pilots



Photograph by Morton Berger

Introducing the Butterfield High Speed Counterbore and Spot Facer in standard and aircraft designs . . . latest example of Butterfield craftsmanship. *Ask your distributor.*

BUTTERFIELD

Union Twist Drill Company ***Butterfield Division*** *Derby Line, Vermont, U. S. A.*

DRILLS • TAPS • DIES • REAMERS • COUNTERBORES • SCREW PLATES

ARMSTRONG WRENCHES

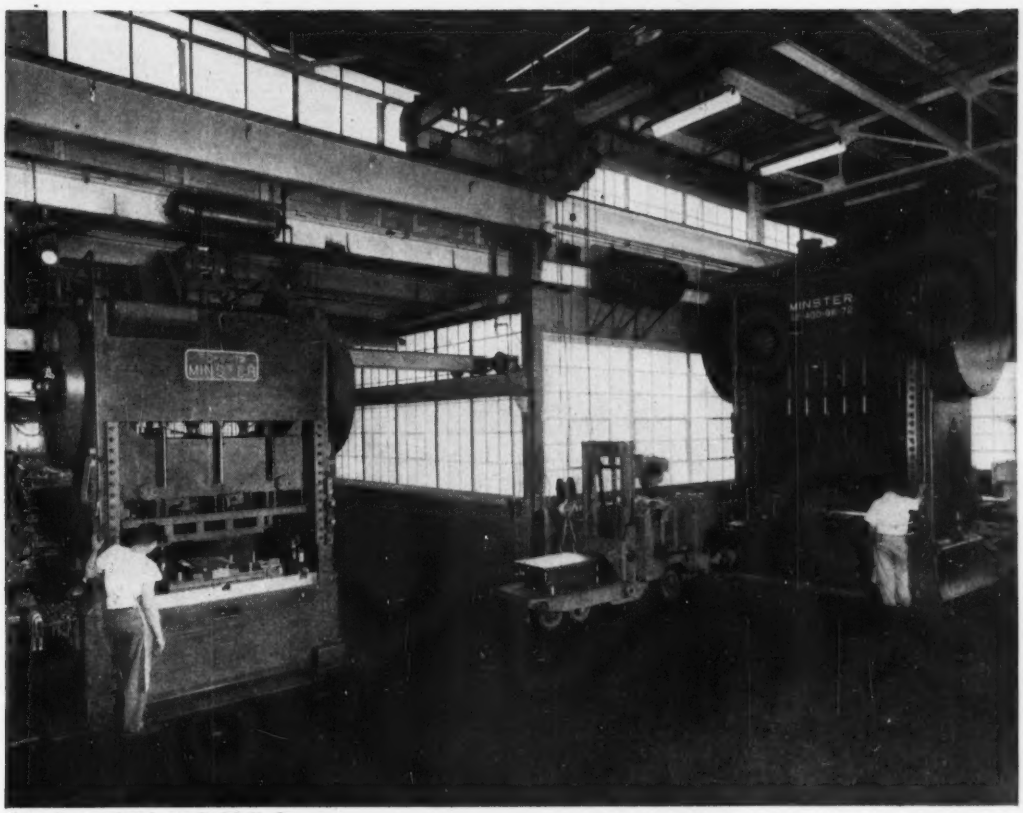
Choose Your Wrenches as you do your friends--for life

Specify ARMSTRONG Wrenches for lifetime service, for finely balanced tools that feel right in the hand and make work easier, faster and less fatiguing. ARMSTRONG Wrenches generally are longer for size—give greater leverage. Accurately milled or broached openings give the proper clearance. They are safe wrenches because they are strong beyond need.

Drop forged and machined from high tensile carbon or special alloy tool steels, ARMSTRONG Wrenches are heat treated, tempered and tested to an exact balance of toughness, hardness and tensile strength. Each is beautiful in finish and line, is a quality tool to be proudly possessed by any mechanic—or certain to "give a lift" to any assembly line. Buy wrenches which carry the trade marks HI-TEN or ARMALOY. On carbon or alloy steel wrenches these trade marks are your guarantee of lifetime quality.

WRITE FOR CATALOG

ARMSTRONG BROS. TOOL CO. *"The Tool Holder People"* 5213 W. ARMSTRONG AVENUE CHICAGO 30, ILL.



Photo—Courtesy East Dayton Tool & Die Co.

IN DAYTON, OHIO, TOOL SHOPS

More Minster Try-out Presses Than All Other Makes Combined

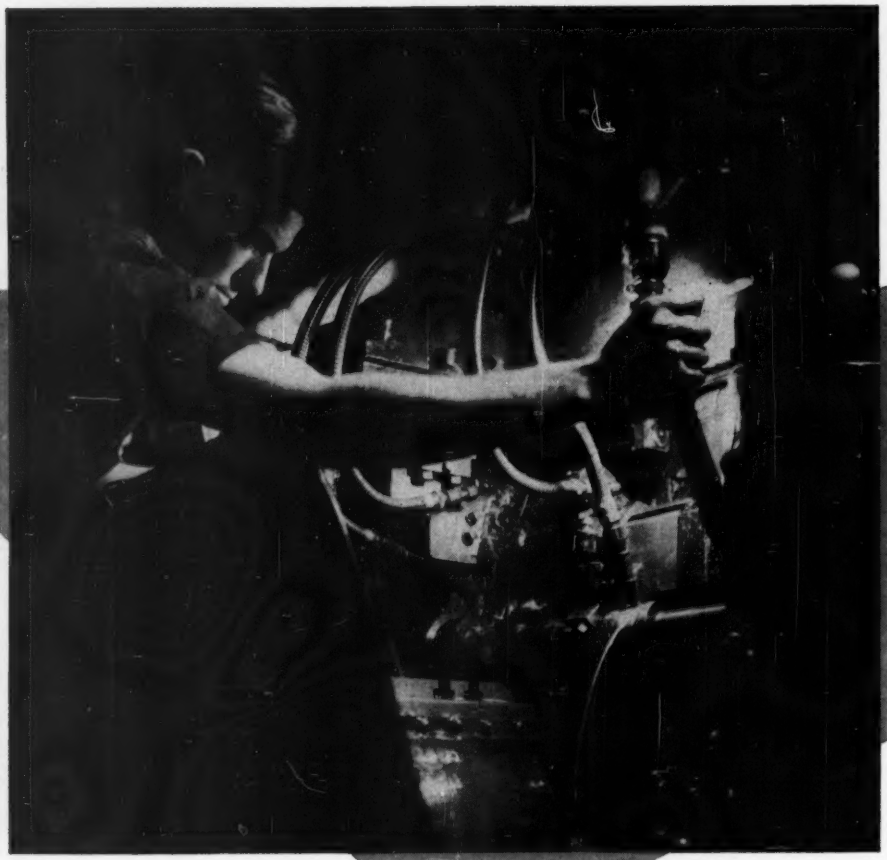
Dayton, Ohio, one of America's greatest tool making centers, expresses an overwhelming preference for Minster presses. In all Dayton shops, large and small, 36 out of 62 presses used for try-out work are Minsters.

Remember this preference for Minster presses the next time you need press equipment. Minster offers excellence of design, performance at its finest, service of unusual dependability.

THE MINSTER MACHINE COMPANY, MINSTER, OHIO

MINSTER
FIRST IN *Press* DESIGN

Here, in the tool zone, is where the superior machinability of Union Drawn Steels pays profits.

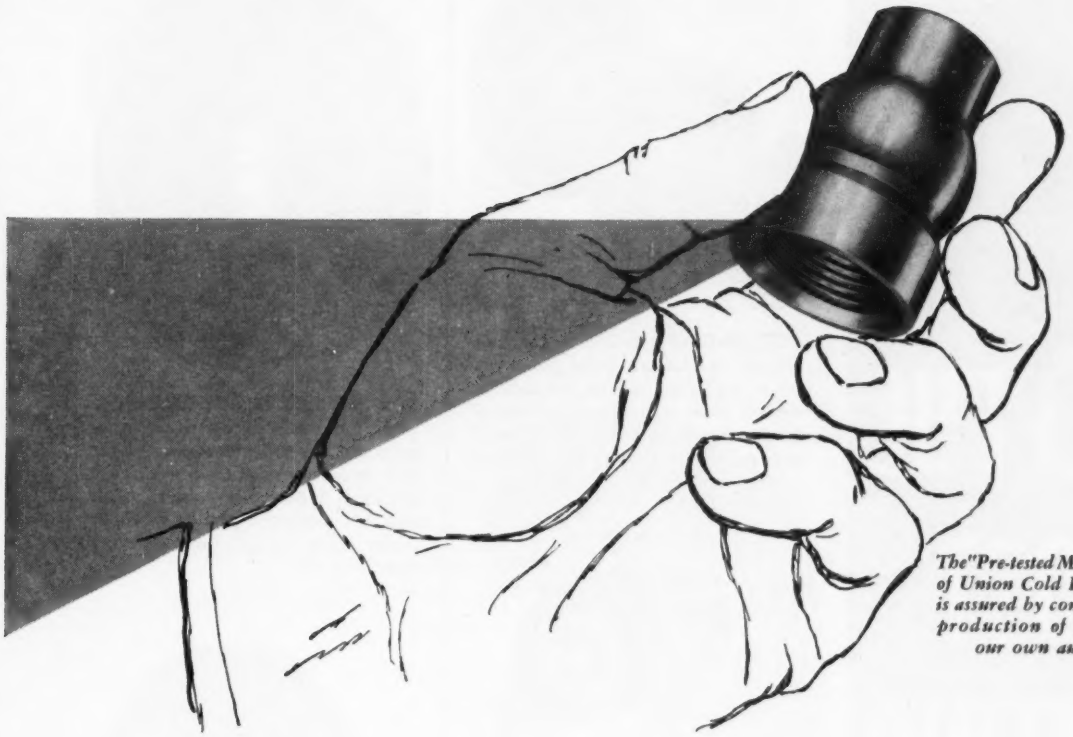


PRE-TESTED MACHINABILITY TO HELP YOU MAINTAIN PRODUCTION...AND PROFITS!

6 HELPFUL MANUALS

filled with how-to-do-it information and data to help you use Republic Union Cold Drawn Steels. Write for "Union Drawn Pocket Library."

REPUBLIC STEEL



The "Pre-tested Machinability" of Union Cold Drawn Steels is assured by continuous test-production of this part on our own automatic.

Your set-up men and automatics can get into production sooner, with fewer headaches, because our automatic screw machine shop at Massillon, Ohio, is the world's largest producer of a completely useless part . . . shown above.

Day-after-day, a modern automatic turns out only this part. It embodies the 6 most common "automatic" operations . . . it tells us how our Republic Union Cold Drawn Steels will behave in *your* shop, on *your* machines. It also tells us how to make Union Drawn Steels even better for automatics . . . even *more* free-machining . . . even *more* profitable for you.

In *your* shop, our Republic Field Metallurgists can help you use the things we have learned in *our* shop . . . better set-ups, heavier feeds and faster speeds, most efficient tool angles . . . all the knowledge to help you make the most of Union Drawn *machinability* on your job schedule and your profit sheet.

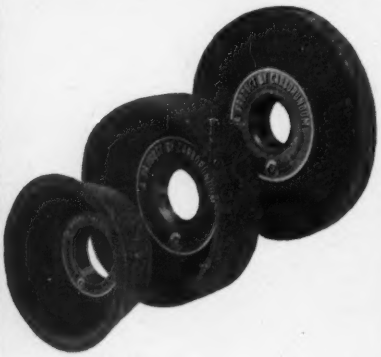
When may we call?

REPUBLIC STEEL CORPORATION
Union Drawn Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N.Y.

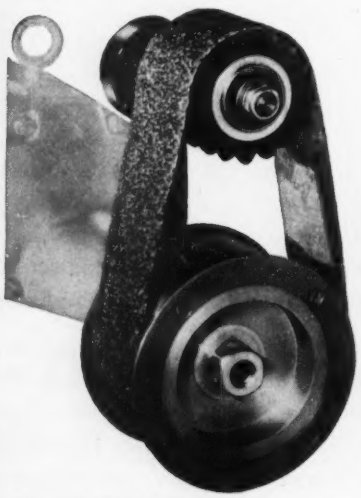
Republic UNION COLD DRAWN STEELS

Free-Machining Bessemer, Alloy and Enduro Stainless Steels
•
Union Cold Drawn Special Sections
•
Union Cold Drawn and Ground Rounds; Turned and Polished Rounds; and Turned, Ground and Polished Rounds (Union Precision Shafting.)

2 pages of HELPFUL COST CUTTING IDEAS for YOU



"GREEN-GRIT" silicon carbide wheels in vitrified bond put keen edges and fine finishes on carbide tipped tools—to close tolerances. Recommended gradings for offhand and surface grinding, wet or dry: rough, GC60-H11-VR; finish, GC100-G5-VR.



NEW "PORT-A-BELT" Grinding Attachment quickly converts any horizontal portable grinder to a belt grinder. It's light—compact—easy to attach. It's a natural for any metalworking shop concerned with die and mold grinding, weld cleanups, edge breaking, contour finishing. Often eliminates 2 or 3 operations.

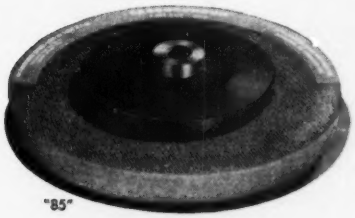
NEW RESILIENT FEED WHEELS prove ideal in centerless grinding of armatures and other work requiring light but even pressures. Wheels are standard A 80-R2-R grading, with specially designed resilient rubber center. They'll save money for every centerless user.

NEW R3 (Rubber) BOND RACEWAY WHEEL lowers costs in the bearings industry. It cuts cool, holds form—reduces regrinds and rejects. One wheel often replaces tandem mountings. You'll get far more output per wheel, too.

...from CARBO

TRADE

"Carborundum", "Aloxite", "Green-Grit", "Red-I-Cut", "Fastcut", "Port-A-Belt", and "MX" are trademarks of The Carborundum Company, Niagara Falls, New York



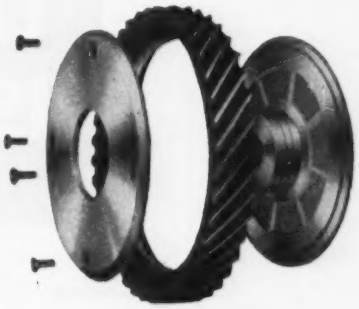
"FASTCUT" Pad 85 Assembly now permits *wet* sanding with discs, a brand new finishing method that gives better finishes in far less time. Complements the "FASTCUT" Pad 87 Assembly for dry disc sanding—another cost-cutter for you!

Abrasive **CUTTING OFF WHEELS**—from 12 to 20 times faster than steel saws—produce smoother cuts at lower cost than other, conventional, methods. Rubber bond for wet cut-off, resinoid bond for dry, "MX" for free hand... CARBORUNDUM makes the *right* wheel for any metallic or non-metallic cut-off job.

"RED-I-CUT" Waterproof Paper has revolutionized wet sanding operations in thousands of shops. With its new flexible backing and a new resin bond, you can confidently expect it to deliver a faster cut, a better finish, and up to 50% longer useful life on production runs.

RUBBER BUSHED WHEELS, used with rubber washers, are being widely adopted because they reduce vibration to a minimum in portable grinding. Results: less operator fatigue, greater output and longer wheel life. Every user of portable equipment should investigate these cost-cutting wheels.

V1 BOND, outstanding performer in internal grinding, is now saving money for users of mounted wheels and points. Why? They last longer, cut faster, hold form better, because V1 Bond is stronger, free-cutting. And for quality of finish obtained, they're unsurpassed.



"T-61" UNIVERSAL HUB CONTACT WHEEL ASSEMBLY now combines economy of longer belt life, achieved by serrated wheel surface, with equally sharp saving in wheel replacement cost. Changeable "tire" idea multiplies wheel versatility too. Hundreds of abrasive belt users are enthusiastic about results.

You profit when you STANDARDIZE on Abrasives by CARBORUNDUM

When you do business with the *only* supplier of all the types of abrasives there are, certain unique advantages are yours to enjoy:

FIRST, a control of abrasive quality which is constant, identical, and dependable—no matter what abrasive method you use.

SECOND, a technical advisory service which brings to your attention every new development in the entire field of abrasives.

THIRD, a refreshing approach to your abrasive problems which only a complete-line source, assuming complete-line responsibility, can offer. Recommendations from CARBORUNDUM are free from bias, completely objective... thus entirely dependable.

For further information on any of the ideas shown here, call your CARBORUNDUM salesman or distributor, write Dept. M 80-31.

RUNDUM

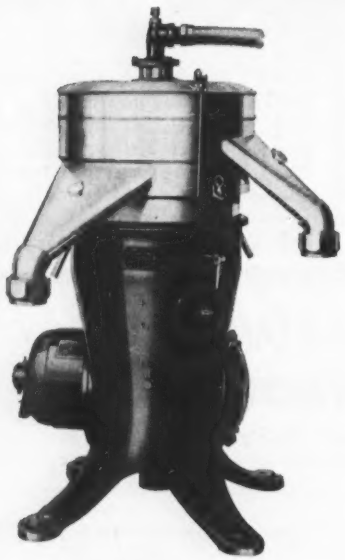
MARK

...the ONLY source for EVERY abrasive product you need

80-31

NO GETTING AROUND IT!

CENTRIFUGED WASH OIL IS A SOURCE OF PROFIT!



Purifying the oil used to wash parts—such as ball bearings—can be a very profitable operation. When the surfaces of the bearings are sprayed with jets of oil, the oil picks up particles that would soon contaminate it if they were not removed. De Laval machines restore this oil to full usefulness instantly, by throwing out all such undesirable solids.

Most metalworking plants present several opportunities to use De Laval centrifugal machines to advantage. Cutting oil . . . lubricating oils . . . shock absorber oils . . . test oils . . . are just a few typical applications in which oil purifiers can be used to get rid of ***solid*** contaminants. Hydraulic oils . . . vacuum pump seal oil . . . can be continuously ***dehydrated*** by the same means. All such applications have one thing in common — the De Laval centrifuge does a complete job of restoring the oil.

THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6

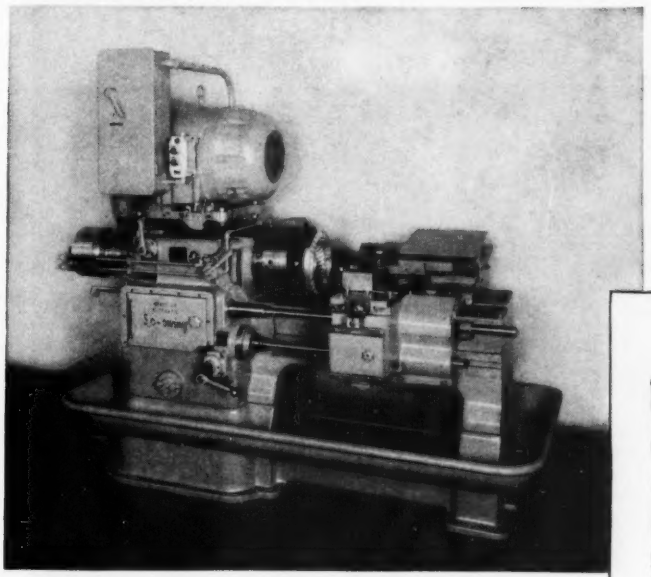
•

DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

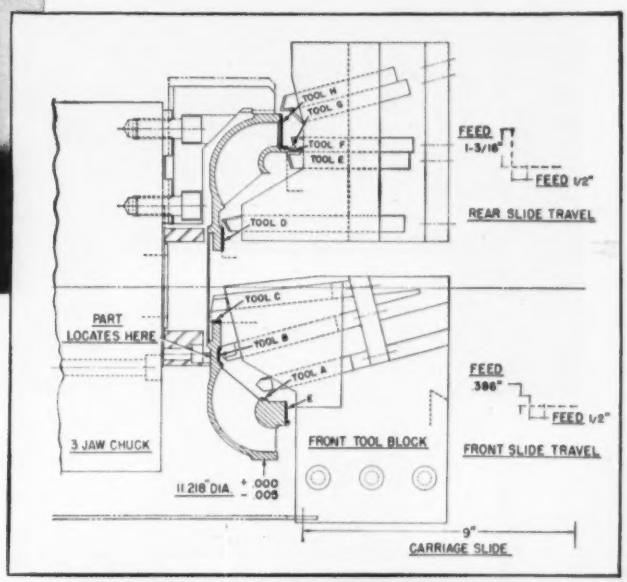
DE LAVAL PURIFIERS AND CLARIFIERS FOR FACTORY OILS

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK



Lo-swing LATHE MACHINES TORQUE CONVERTER COUPLING AUTOMATICALLY



Problem: To bore, turn and face several dimensions on aluminum torque converter couplings.

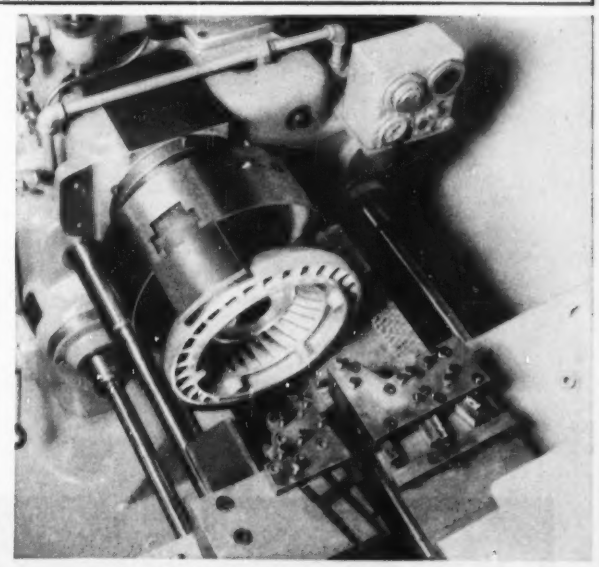
Solution: The Model LR Automatic Lo-swing Lathe was selected for this job and special tooling developed to enable all dimensions to be machined in one chucking. The work is held in an air-operated, three-jaw chuck fitted with mushroom type jaws to prevent distortion of the casting.

Carbide cutting tools are mounted on the front and rear slides as illustrated. Both front and rear slides have cross and longitudinal movements permitting either boring or turning operations combined with facing operations. All tools cut simultaneously and the entire sequence of operation is automatic.

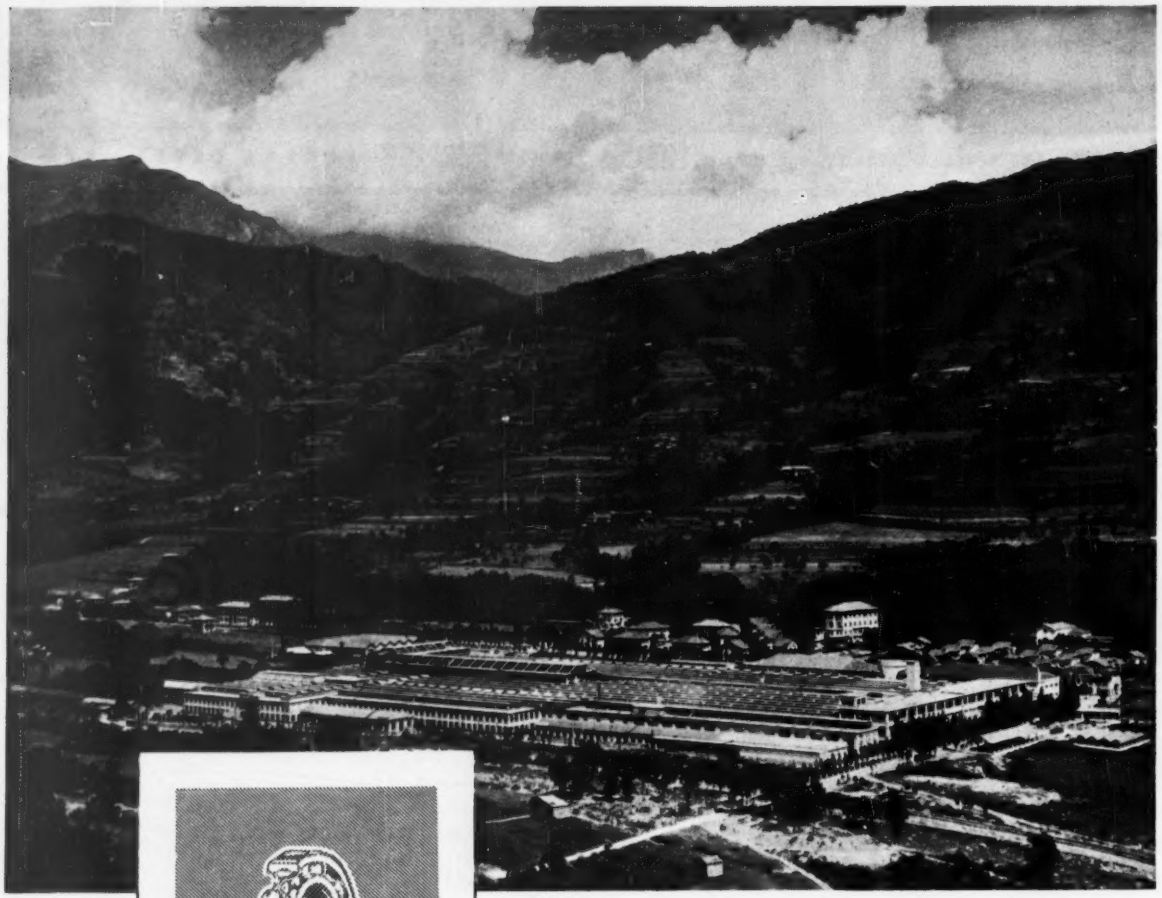
The line drawing above shows the tooling layout and identifies the surfaces finished by each individual tool. A production of 60 pieces per hour at 80% efficiency is maintained.

Let Seneca Falls engineers assist in solving your automatic turning problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.



PRODUCTION COSTS ARE LOWER WITH Lo-swing



RIV - OFFICINE DI VILLAR PEROSA - S. p. A. TURIN (ITALY)
VILLAR PEROSA FACTORY

RIV - OFFICINE DI VILLAR PEROSA
S. p. A. TURIN (ITALY)

ESTABLISHED IN 1906: almost 50 years of steady development are a guaranty of wide engineering experience.

3 FACTORIES: at Turin, Villar Perosa, Aquanio, covering altogether an area of 200'000 square meters, constitute an industrial group of high productive possibilities.

100 ENGINEERS: place their technical knowledge and practical experience at the service of every customer.

1500 OFFICE WORKERS: make up an efficient commercial and administrative organization.

9000 WORKMEN: contribute their labor and skill to an ever improving and increasing production.

8000 MACHINE TOOLS: mean an industrial capacity of world importance.

CONTROLS AND INSPECTIONS: carried out at every manufacturing stage ensure an exact conformity of parts to constructional tolerances.

RIV manufacture: Single-row Radial Ball Bearings • Double-row Radial Ball Bearings • Self-aligning Radial Ball Bearings • Single-row Angular-contact Ball Bearings • Double-row Angular-contact Ball Bearings • Cylindrical Roller Bearings • Single-row Barrel-shaped Roller Bearings • Double-row Barrel-shaped Roller Bearings • Needle Roller Bearings • Taper Roller Bearings • Single-thrust Ball Bearings • Double-thrust Ball Bearings • Thrust Barrel-shaped Roller Bearings • Shielded Bearings • Sealed Bearings • Balls, Rollers and Needle Rollers • Pillow Blocks • Tram- and Railway Journal Axle-boxes • Journal Axle-boxes for Small Wagons • All types of special bearings, in every size (metric and inch dimensions), with outside diameters ranging from 10 mm to over 4 meters, for every application.

C & C SALES CORPORATION
REPRESENTATIVES OF LEADING BEARING MANUFACTURERS
1771 BROADWAY — NEW YORK 19, N. Y.

Unretouched Photograph by Morton Berger

TAPS *by* CARD

Performance on the job **is what guides all Card manufacture. For generations, Card has had but one objective — to make the best taps money can buy.**

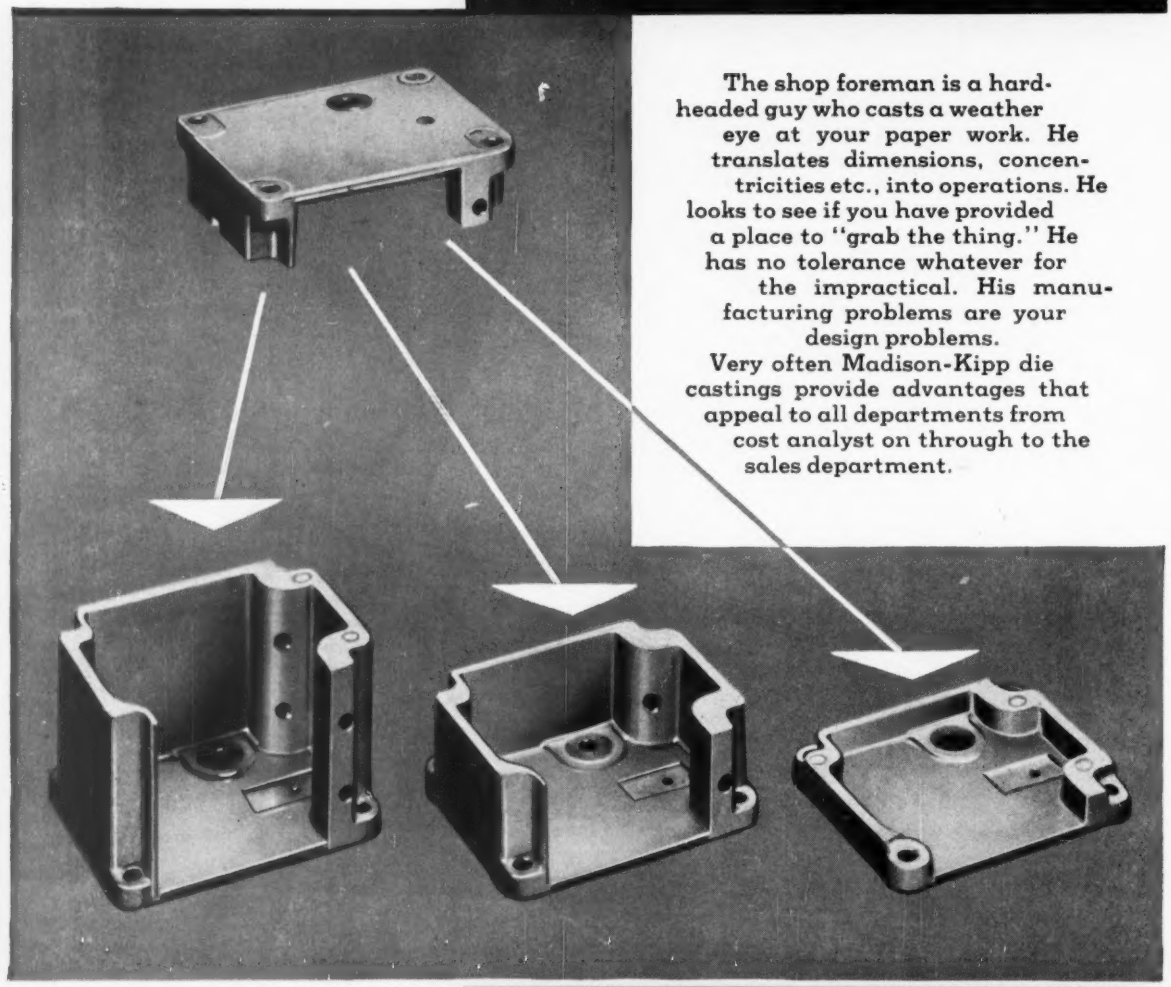
S. W. CARD MANUFACTURING CO., MANSFIELD, MASS. • DIVISION OF UNION TWIST DRILL CO. The CARD Quality **TAPS • DIES • SCREW PLATES**

A MASTER DESIGN *formula:*

To have your new design meet the approval of your shop foreman as well as the boss — because foremen know most about the practical side of your manufacturing equipment and personnel.

MADISON-KIPP ZINC AND ALUMINUM DIE CASTINGS

OFTEN PREFERRED BY DESIGNERS, MANAGERS, AND FOREMEN



The shop foreman is a hard-headed guy who casts a weather eye at your paper work. He translates dimensions, concentricities etc., into operations. He looks to see if you have provided a place to "grab the thing." He has no tolerance whatever for the impractical. His manufacturing problems are your design problems.

Very often Madison-Kipp die castings provide advantages that appeal to all departments from cost analyst on through to the sales department.

3 different instruments with 4 Madison-Kipp Die Castings — each with a special bearing insert — each casting with matching countours, locating points and centers, made for MICRO, Makers of Precision Switches, Freeport, Illinois.

MADISON-KIPP CORPORATION

203 WAUBESA STREET • MADISON 10, WIS., U.S.A.

• Skilled in Die Casting Mechanics • Experienced in Lubrication Engineering • Originators of Really High Speed Air Tools

Product Directory

To find headings easily, look for capital letters at top of each page to denote locations.

ABRASIVE CLOTH, Paper and Belt

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

ABRASIVE DISCS

See Discs, Abrasive.

ABRASIVES, Polishing, Tumbling, Etc.

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.

ACCUMULATORS, Hydraulic

American Steel Foundries, Elmes Engineering Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Farquhar, A. B., Co., 21 Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., Alliance, Ohio.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

AIR HOISTS—See Hoists, Air.

AIR TOOLS—See Grinders, Pneumatic; Drills, Portable Pneumatic, Etc.

ALLOY STEELS

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York 1, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Frasse, Peter A., & Co., Inc., 17 Grand St., New York 13, N. Y.
Republic Steel Corp., Union Drawn Steel Div., Republic Bldg., Cleveland, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., Carnegie-Illinois Steel Corp. Div., 436 7th Ave., Pittsburgh, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

ALLOY STEELS, High Temperature

Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.

ALLOYS, Aluminum

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.

ALLOYS, Magnesium

Dow Chemical Co., Midland, Mich.

ALLOYS, Non-Ferrous

American Brass Co., 25 Broadway, New York.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

ARBOR PRESSES

See Presses, Arbor.

ARBORS AND MANDRELS

Beaver Tool & Engineering Corp. (Arbors, only), 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co, 1242 E. 49th St., Cleveland, Ohio.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Erickson Tools Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Grand Tool & Supply Co., 172 Grand St., New York 13, N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

BABBITT

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.
Ryerson, Jos. T., & Son, 2558 W. 16th St., Chicago 18, Ill.

BALANCING EQUIPMENT

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Gisholt Machine Co. (Static and Dynamic), 1245 E. Washington Ave., Madison 10, Wis.

(Continued on page 294)

with "DETROIT" you save mounting costs, increase production runs

First: "Detroit" craftsmen, working with finest precision equipment, take pride in the superior quality of every "Detroit" Die Set. ***Second:*** Every set is fully assembled and inspected at the factory. Here are complete inspection facilities and testing skill that mean each "Detroit" Die Set is right before it is shipped.

For prompt delivery, or information, call your "Detroit" representative.

CALL "DETROIT"

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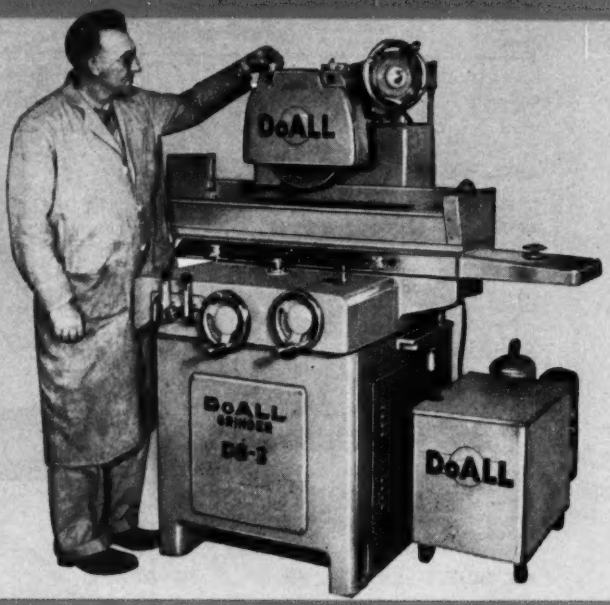
CHICAGO	PU 5-7694
CINCINNATI	HU 7775
CLEVELAND	TO 1-0860
DALLAS	TE 3818
DAYTON	HE 3042
HAMILTON, CAN.	9-2683
INDIANAPOLIS	HU 5604
LOS ANGELES	AD 7251
MILWAUKEE	GL 3-7170
MINNEAPOLIS	PR 1822
MONTREAL, CAN.	WI 1186
NASHVILLE	7-0437
NEWARK	MA 2-4318
ORLANDO, FLA.	2-3747
PHILADELPHIA	VI 4-4084
PITTSBURGH	LO 1-4011
ROCK ISLAND, ILL.	RI. 8-2814
ST. LOUIS	FR 6811
SEATTLE	SE 7997
TOLEDO	MA 4510

DETROIT DIE SET CORPORATION
2895 W. GRAND BLVD. • DETROIT 2, MICH.

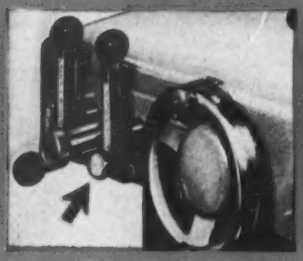
DETROIT DIE SET ★

NOW... A GREAT

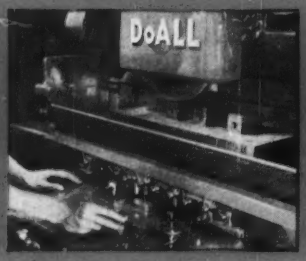
D-6 Models—6" x 18" and 6" x 24" sizes. Manual and hydraulic operation—7" wheels.



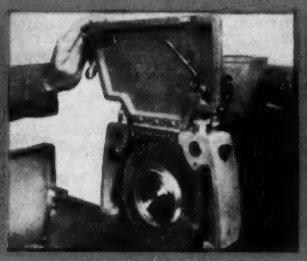
D-8 Models—8" x 24" with 10" or 14" wheels. Manual and hydraulic operation.



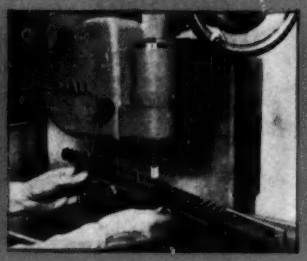
Variable speed wheel dressing



Skip feed for intermittent plunge grinding.



New flood and "Cool-Grinding" system.

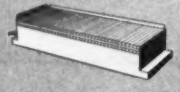


High speed spindle, vertical or horizontal.

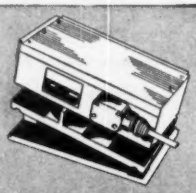
ATTACHMENTS and ACCESSORIES

1. **Coolant System** —"Cool-Grind" (coolant through the wheel) or flood grind, or both simultaneously.
2. **Coolants** for every job.
3. **New Laminated-top Magnetic Chuck.**
4. **Magnetic Sine Chuck**—for fast easy setups on single or compound angle work.
5. **Selectron**—for controlling magnetic chuck holding power—and demagnetizing.
6. **High Speed Spindle Attachment Vertical or Horizontal**—provides speeds up to 20,000 RPM, for use of very small wheels.
7. **Variable Spindle Drive**—electronic control provides infinitely variable speeds.
8. **Crush Dresser Spindle Drive**—slow-speed drive for wheel crushing.
9. **Crush Grinding Attachment**—provides steady table speeds down to 1" per minute—includes heavy duty spindle.
10. **Adjustable Crush Roll Idler Stand**—permits tilting of crush rolls.
11. **Motor-Driven Crush Roll**—for forming grinding wheel or crush rolls.
12. **Automatic Downfeed**—can be set to feed at each reversal, or alternate reversals of table.
13. **Automatic Skip Feed**—table travel speeds up between multiple work pieces when plunge grinding.

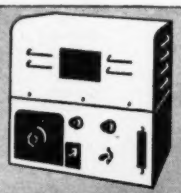
BAND MACHINES



MAGNETIC CHUCK

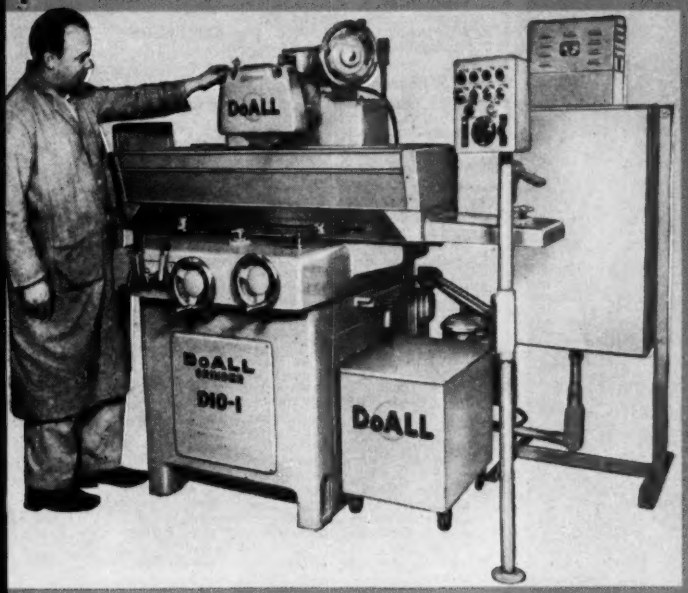


SINE CHUCK

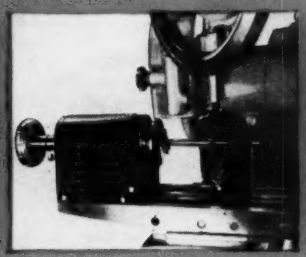


SELECTRON

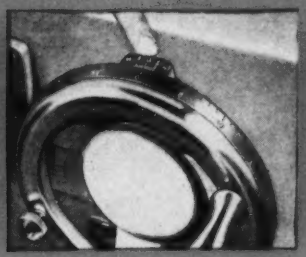
NEW LINE OF DoALL *Precision* SURFACE GRINDERS



D-10 Models—10" x 30" chuck with 10" or 14" wheels.



Cylindrical grinding and indexing attachment.



Slip rings for zeroing handwheels.

- *NEW* SIZES—including 6" x 24" and 10" x 30".
- *NEW* 12½" WORK HEIGHT CAPACITY.
- *NEW* SPEEDS—up to 100 fpm table travel.
- *NEW* RECIRCULATING "COOL-GRINDING" SYSTEM.
- *NEW* RIGIDITY AND STURDINESS.
- *NEW* ATTACHMENTS AND ACCESSORIES.
- *NEW* CONVENIENT CONTROLS.
- *NEW* FULLY AUTOMATIC OPERATION.

...and more!

NEW DoALL Surface Grinders will handle an unlimited variety of surface grinding, cylindrical grinding and form grinding jobs with a heretofore unattainable combination of precision and speed.

You have to see them perform to visualize their capabilities. Ask to have a free demonstration in your own plant. Call your local DoALL Sales-Service Store, or write:

THE DoALL COMPANY
254 N. Laurel Ave. Des Plaines, Ill.

14. **Fully Automatic Surface Grinding**—controls cross-feed and downfeed automatically.
15. **Cylindrical Grinding Attachment**—for straight and taper cylindrical grinding and indexing.
16. **Dust Collector**—for all dry grinding operations.
17. **Wheel Dressing Diamonds and Holders.**
18. **Universal Vise**—completely adjustable for holding work in any position.
19. **Set of Plain Centers.**
20. **Wheel Balancing Stand and Arbors.**
21. **Grinding Wheels.**
22. **Complete Electrical Panel Remote Control Systems.**

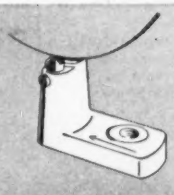
DoALL

NEW CATALOG

Free. Complete data and description of DoALL Grinder design and construction—coolant systems—controls—automatic setups—attachments. Ask for your copy.

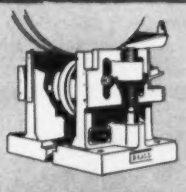
COOLANTS

GRINDING WHEELS



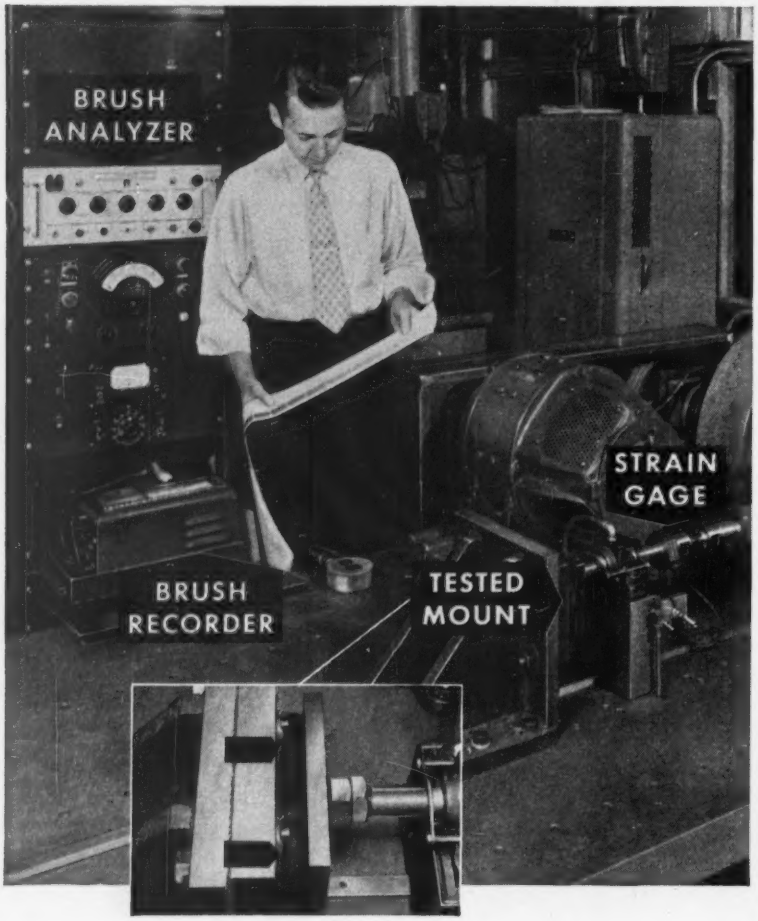
DIAMOND DRESSER

DUST COLLECTOR



CRUSH ROLLS

GAGE BLOCKS



VIBRATION STUDY

saves time and money with Brush Analyzer

HERE, in the plant of a large automotive manufacturer, this test of vibration characteristics of rubber engine mounts requires no laborious plotting of test data. The shock mounts are tested under dynamic conditions. Using strain gages on the actuating driver, the Brush Recording Analyzer charts test results instantaneously while the test is underway. Saves valuable engineering time, and the charts provide a complete history of test. Find out how *you* can simplify the solving of many electrical and mechanical test problems with Brush Instruments. Write for bulletin F-618.

For the finest electronic products for instrumentation, acoustics, piezoelectric materials, ultrasonics and magnetic recording—look to Brush. Brush Electronics Company, Dept. LL-2, 3405 Perkins Avenue, Cleveland 14, Ohio.

BRUSH ELECTRONICS COMPANY

ELECTRONIC INSTRUMENTS FOR INDUSTRY
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ULTRASONIC EQUIPMENT • TAPE RECORDERS
RECORDING EQUIPMENT

BRUSH ELECTRONICS

formerly The Brush Development Co. Brush Electronics Company is an operating unit of Clevite Corporation

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Pope Machinery Corp., Haverhill, Mass.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

BALLS

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Kennametal, Inc., Latrobe, Pa.
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.

BARS, Phosphor Bronze

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.

BARS, Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Frasse, Peter A., & Co., Inc., 17 Grand St., New York 13, N. Y.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Union Drawn Steel Div., (Cold Drawn), Republic Bldg., Cleveland, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

BASES, Machinery Welded

Mahon, R. C., Co., 6565 E. 8 Mile Rd., Detroit 34, Mich.

BEARINGS, Babbitt

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.
Link-Belt Co., 2410 W. 18th St., Chicago 8, Ill.

BEARINGS, Ball

Aetna Ball & Roller Bearing Co., 4612 Schubert Ave., Chicago, Ill.
Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Fafnir Bearing Co., New Britain, Conn.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
New Departure Div., General Motors, Bristol, Conn.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Norma-Hoffmann Bearings Corp, Stamford, Conn.
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Torrington Co., Torrington, Conn.

BEARINGS, Bronze and Special Alloy

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Johnson Bronze Co., New Castle, Pa.
Link-Belt Co., 2410 W. 18th St., Chicago 8, Ill.

BEARINGS, Lineshaft

Fafnir Bearing Co., New Britain, Conn.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Shafer Bearing Corp., Downers Grove, Ill.
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Orange Roller Bearing Co., Inc., Orange, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

BEARINGS, Needle

C & C Sales Corp., 1771 Broadway, New York 19, N. Y.

(Continued on page 296)

Bodine CASE HISTORY NO. 32

...AN AUTOMATIC ASSEMBLY OF STUD, SPRING AND SLEEVE

PRODUCTION: This Bodine No. 40-10 Dial Type automatic assembly machine produces 1500 completed parts per 50 minute hour at 30 strokes per minute. One operator can attend several machines. Top view shows tooling with 3 Syntron type hoppers to feed stud, spring and sleeve. Tolerance held to overall height of ±.008. Our engineers provide an overall service to solve your specific problems with Bodine automatics and tooling for drilling, milling, tapping, screw insertion and assembly.

You can't meet Tomorrow's Competition with Yesterday's Machine Tools

THE **Bodine** CORPORATION
BRIDGEPORT 5, CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

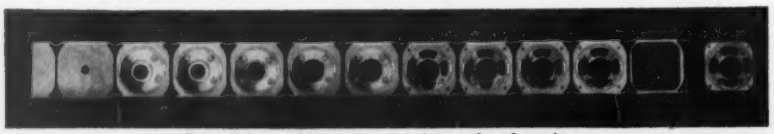
15052

B. Jahn PROGRESSIVE DIES SAVE* AMERICAN INDUSTRIES Millions!

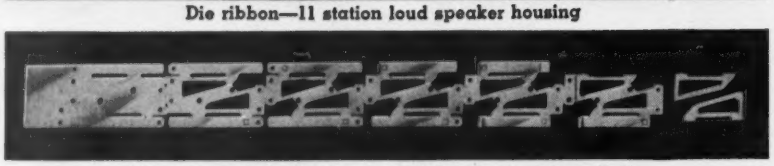
Thousands of unnecessary, costly operations have been eliminated from America's production lines by B. Jahn! Actual die strip photographs illustrate intricate — seemingly impossible tooling problems overcome by B. Jahn's versatility and ingenuity.

Production runs increase — set-up time is slashed — individual press operations are eliminated — better die products result — for every B. Jahn built die is PRODUCTION PROVED *to the customer's complete satisfaction.*

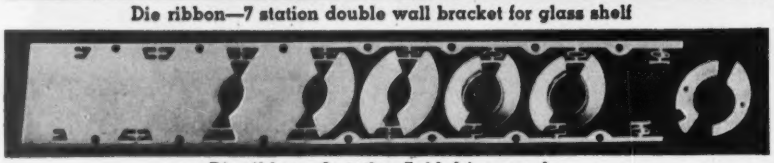
*B. Jahn Progressive dies not only SAVE millions, they MAKE millions!



Die ribbon—11 station loud speaker housing



Die ribbon—7 station double wall bracket for glass shelf



Die ribbon—6 station fluid drive coupler

By running from 10 to 50,000 parts or complete assemblies for customer's production line use *before the die is delivered,* error is eliminated! guesswork ended! chance abolished! The die is certified PRODUCTION PROVED!

SEND FOR THE FACT-PACKED "STORY OF B. JAHN PRODUCTION-PROVED DIES" NOW!

Read the many illustrated, money-making case histories! Find out how B. Jahn eliminates major tooling problems for engineers! See the many intricate die ribbons from B. Jahn Dies! Learn about the 165 skilled B. Jahn craftsmen and their ultra-modern facilities! Engineers, this is money-making *must* reading, send today!

Investigate B. Jahn and Invest in Production Economy!

PRODUCTION B. Jahn PROVED

B. Jahn

THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Orange Roller Bearing Co., Inc., Orange, N. J.
Torrington Co., Torrington, Conn.

BEARINGS, Roller

Aetna Ball & Roller Bearing Co., 4612 Schubert Ave., Chicago, Ill.
Ball & Roller Bearing Co., Danbury, Conn.
C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., Harrison, N. J.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearings Co., Inc., 541 Seymour St., Syracuse, N. Y.
Shafer Bearing Corp., Downers Grove, Ill.
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Timken Roller Bearing Co., Canton, Ohio.
Torrington Co., Torrington, Conn.

BEARINGS, Self-Lubricating (Oilless)

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.

BEARINGS, Tapered Roller

C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Timken Roller Bearing Co., Canton, Ohio.
Torrington Co., Torrington, Conn.

BEARINGS, Thrust

Aetna Ball & Roller Bearing Co., 4612 Schubert Ave., Chicago, Ill.
Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Fafnir Bearing Co., New Britain, Conn.
General Electric Co., Schenectady, N. Y.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Shafer Bearing Corp., Downers Grove, Ill.
Timken Roller Bearing Co., Canton, Ohio.
Torrington Co., Torrington, Conn.

BELT FASTENERS, Metal, Leather, Etc.

Bristol Co., Platts Mills, Waterbury, Conn.

BELT SHIFTERS

Standard Pressed Steel Co., Jenkintown, Pa.

BELTING TRANSMISSION

Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.

BENCHES, Work, and Bench Legs

Standard Pressed Steel Co., Jenkintown, Pa.

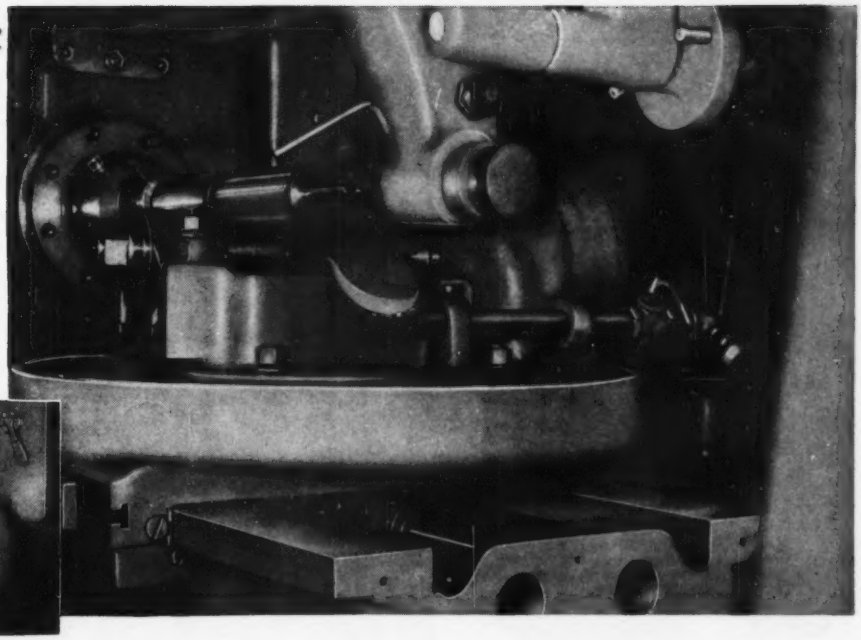
BENDING MACHINES, Angle Iron, Plate, Etc.

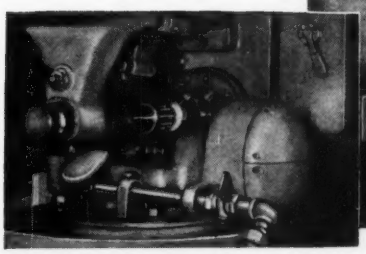
Consolidated Mch. Tool Corp., 565 Blossom Rd., Rochester, N. Y.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Kling Bros. Engineering Works, 1320 No. Kostner Ave., Chicago 51, Ill.
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Struthers Wells Corp., Macninery Div., Titusville, Pa.

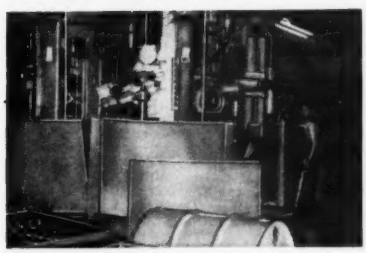
BENDING MACHINES, Hydraulic

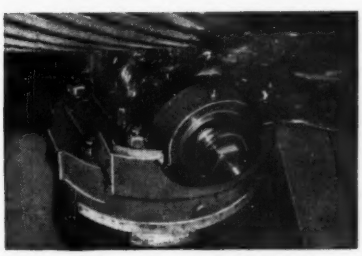
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Farquhar, A. B., & Co., 21 Duke St., York, Pa.

(Continued on page 298)









"ON-THE-JOB" CUTTING OIL TESTS BY CITIES SERVICE ENGINEERS!

at Timken-Detroit Axle Company

TOOL WEAR REDUCED 25%... MANUFACTURING COSTS ALSO CUT!

In an effort to reduce tool wear and cut manufacturing costs, the Wisconsin Division of Timken-Detroit Axle Company at Oshkosh called in Cities Service Engineers to make "on-the-job" tests.

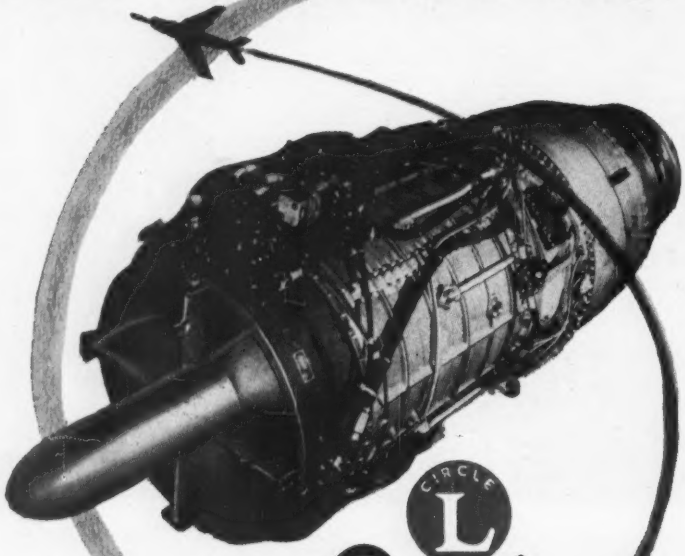
Cities Service Lubrication Engineers made an on-the-spot study of the Timken-Detroit operation. This "on-the-job" evaluation by skilled Cities Service Engineers, long practiced in solving like problems, resulted in a recommendation for the use of a Chillo Cutting Oil that actually reduced tool wear 25% with proportionate savings in manufacturing costs!

WHAT ARE YOUR PROBLEMS? Why not take advantage of free, "on-the-job" testing? Call for our lubrication engineers at the office nearest you, or write Cities Service Oil Company, Dept. B12, Sixty Wall Tower, New York City 5, New York.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

AHEAD OF THE VAPOR TRAIL . . .



CIRCLE L

LEBANON Castings ARE AT WORK

THAT streak in the sky is a Curtiss-Wright Sapphire J-65 Turbo Jet Engine powering a high-altitude plane. The intense heat—approximately 1500° F.—developed during flight is enough to disintegrate "normal" materials, formed in the usual way. Yet in this inferno of power Lebanon Stainless Steel Centrifugal* Castings of special heat-resistant alloys are giving dependable service as . . .

TURBINE SHROUDS
HEAT SHIELD SUPPORTS
EXHAUST CONE FLANGES
COMBUSTION CHAMBER FLANGES
TURBINE BLADE SPACER RINGS

*"*CENTRI-DIE", *patented name for method of casting steel centrifugally in metal molds, under license agreement with Firth-Vickers Stainless Steels Limited, Sheffield, England. Lebanon also makes steel castings, both static and centrifugal, in refractory molds.*

Have you seen . . . STEEL WITH A THOUSAND QUALITIES?

This 37-min., 16 mm., full-color sound film showing steel castings from blueprint to end use should be shown to your organization. For information, write: Dept. X, Lebanon Steel Foundry, Lebanon, Pa.

LEBANON Castings

CARBON, SPECIAL ALLOY AND STAINLESS STEEL

CIRCLE L

LEBANON STEEL FOUNDRY LEBANON, PA.

Hannifin Corp, 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., Alliance, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Struthers Wells Corp., Machinery Div., Titusville, Pa.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

BENDING MACHINES, Pipe

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Farquhar, A. B., & Co., 21 Duke St., York, Pa.
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

BLAST CLEANING EQUIPMENT

Leiman Bros., Inc., 156 Christie St., Newark, N. J.
Pangborn Corp., Hagerstown, Md.
Wallis Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

BLOWERS

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Leiman Bros., Inc., 156 Christie St., Newark, N. J.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

BOILER TUBES

Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Republic Steel Corp., Steel and Tubes Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

BOLT AND NUT MACHINERY

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
New Britain Machine Co., New Britain-Gridley Mch. Div., New Britain, Conn.

BOLTS AND NUTS

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Ottemiller, W. H., & Co., York, Pa.
Republic Steel Corp., Bolt & Nut Div., Republic Bldg., Cleveland 1, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.

BOLTS, T-Slot

Standard Shop Equipment Co., Inc., 8299 W. Tinicum Ave., Philadelphia, Pa.

BOOKS, Technical

Industrial Press, 148 Lafayette St., New York 13, N. Y.
Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio.

BORING AND DRILLING MACHINES

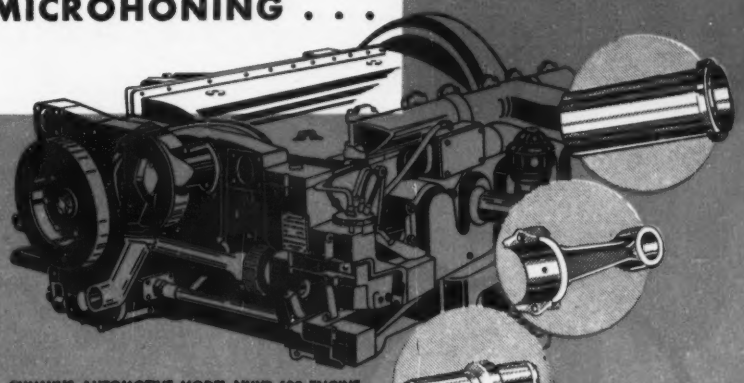
Baker Bros., Inc., Sta. F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Canedy-Otto Div. Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Moline Tool Co., 102 20th St., Moline, Ill.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Wales-Strippit Corp., North Tonawanda, N. Y.

(Continued on page 302)

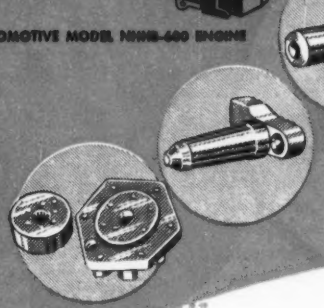
INCREASED EFFICIENCY OF

DIESEL ENGINES

THROUGH MICROHONING . . .



CUMMINS AUTOMOTIVE MODEL NHHB-600 ENGINE



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Diesel engines are chosen because of their dependable low cost power. The more precise the fit of parts, the more efficient the engine.

MICROHONING gives to functional surfaces of

- cylinder liners
- connecting rods
- valve guides
- injector barrels
- pump discs . . .

accurate size, true geometry, and the characterized finish—all at production rates.

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MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

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614 Empire Building
26 So. Main Street
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Los Angeles 23, California

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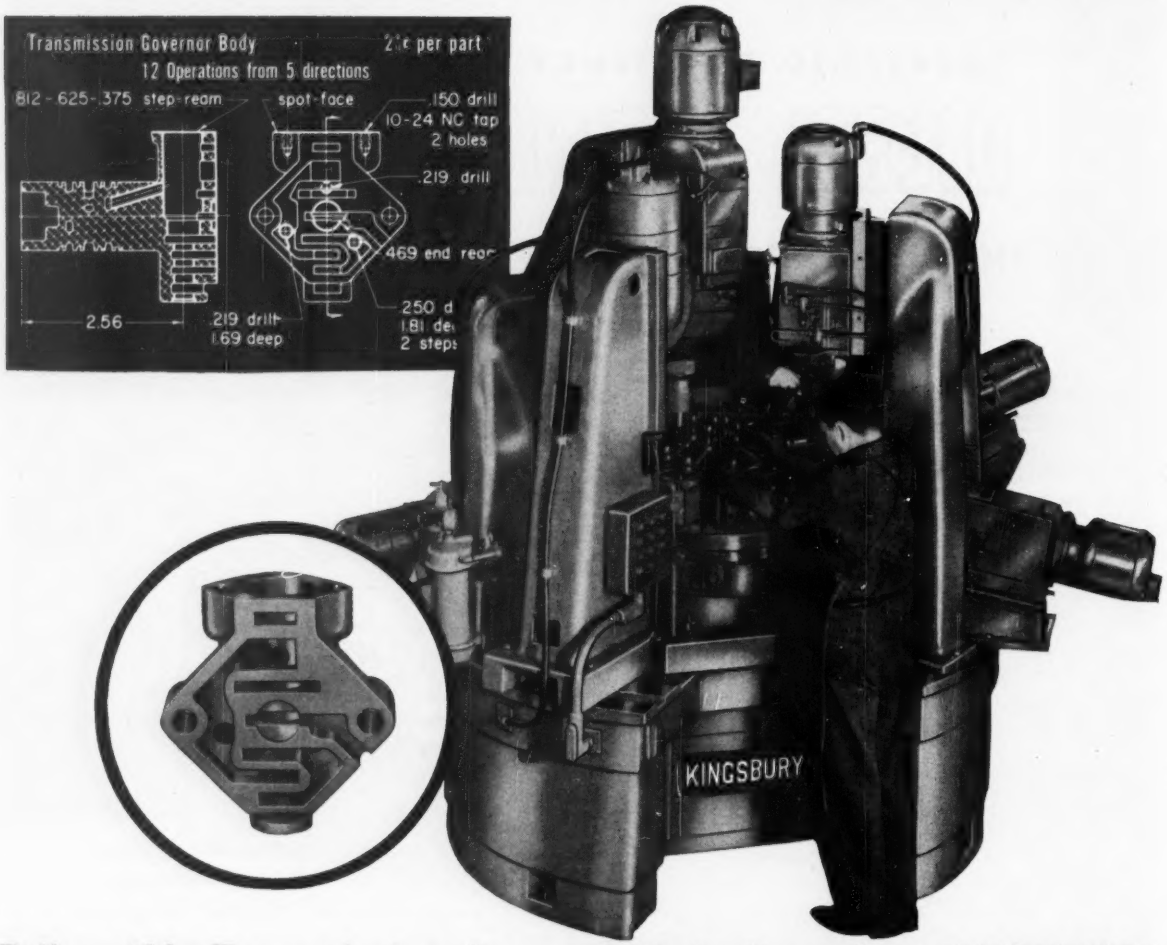
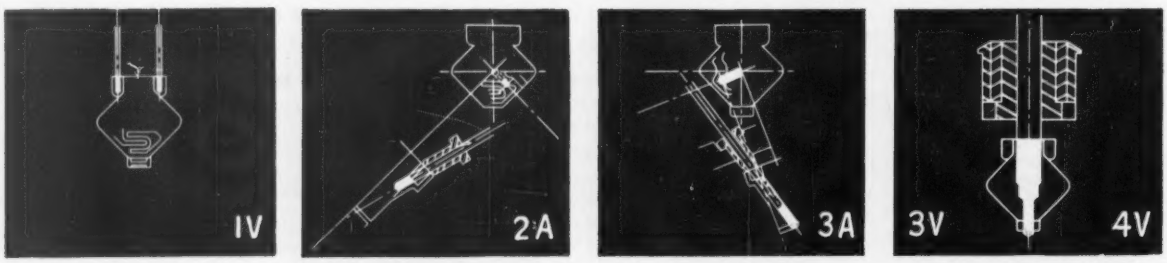
REPRESENTATIVES: Overgard Machine Tool Company, 234 Commonwealth Bldg., Denver 2, Colorado
Hallidie Machinery Co., 2726 First Ave., South, Seattle, Wash. • *REPRESENTATIVES IN ALL PRINCIPAL COUNTRIES*

Every few seconds your Kingsbury will



Follow this Transmission Governor Body through a KINGSBURY



Designing a Kingsbury to drill, ream, tap and spot-face this die cast aluminum Transmission Governor Body presented some interesting problems. Units at six stations perform 12 operations from five directions and produce 360 parts per hour gross. There are four vertical (V) units, four angle (A) units, and one horizontal (H) unit. Let's follow the part in its cycle through the machine.

At Station 1, Unit 1-V drills two .150 holes.

Station 2 has two units. Unit 2-A spot drills .250 hole .500 deep at an angle of 10° uphill and 9° right of center line through the work fixture. Note the guide bushing. Unit 2-V (not sketched) operates a 1.750 spot-facing tool.

Stations 3 and 4: Unit 3-A drills .219 hole 1.69 deep at an angle of 6° uphill and 15° left of the center line through the work fixture. Unit 3-V (the tallest) has a 2-spindle auxiliary head with one spindle operating at Station 3 and the other at Station 4. Jergens rotary bearings guide these tools. Spindle 3-V end-reams a hole .782-.595-.331. Spindle 4-V finish-reams the hole .812-.625 .375. At Station 4, Unit 4-H operates a .469 end-cut reamer .11 deep.

The operation at *Station 5* is something special. It was interesting to

deliver another finished part—at low cost

Kingsbury Machine Tools soon pay for themselves in high production runs

Each Kingsbury is designed and built to perform certain operations accurately and automatically. Work fixtures on an index table hold the parts and present them to the various operating units in turn. These units of ½ to 5 hp drill, ream, c'bore, mill, tap, thread, etc.

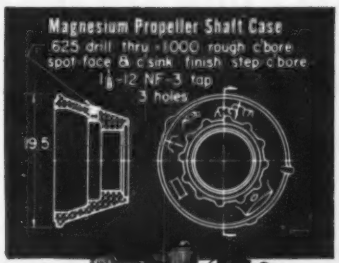
These combined operations cut unit costs in several ways:

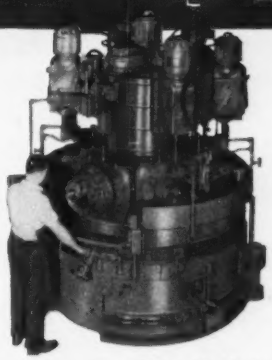
1. Increased production per man-hour.
2. Almost no scrap loss. Each part is machined uniformly to specifications.
3. Less floor space than required for separate machines.
4. Less handling of parts.

This is only part of the story. Do you want the rest?

Kingsbury Machine Tool Corp.
100 Laurel St., Keene, N. H.

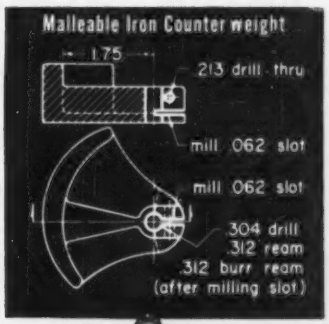
KINGSBURY
AUTOMATIC DRILLING AND TAPPING MACHINES
for Low-Cost High Production

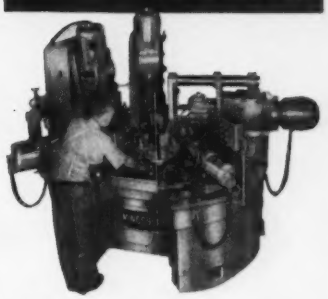

Magnesium Propeller Shaft Case
.625 drill thru - 1.000 rough c'bore
spot face & c'sink finish step c'bore
1⅛-12 NF-3 tap
3 holes
19.5



Magnesium Propeller Shaft Case
90 parts per hour gross
13 9/10¢ per part

Here is an unusual application of a Kingsbury with central column. Five vertical units perform the same five operations on three holes in three passes around the machine. Each part is chuckled in three fixtures, one at a time, to locate it for the three holes. This rechucking saves two machines.

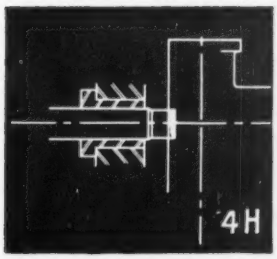


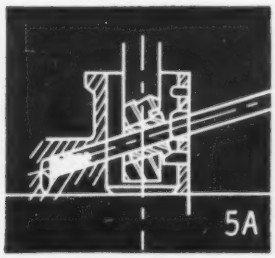


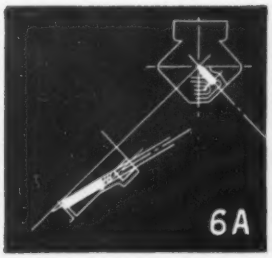
Counterweight—3¢ per part
200 parts per hour gross

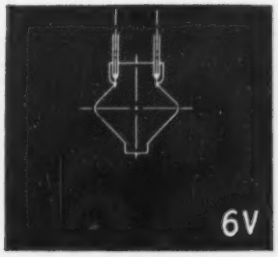
This Kingsbury performs six operations from two directions. It drills two holes, mills two slots, and reams the two holes. Parts are clamped in seven fixtures on a 20-inch dia. index table; two vertical and four horizontal units perform the operations at six working stations.

as it produces 360 parts per hour gross—at 2 4/10¢ each









work out, and naturally we are proud of the result. The job required a .219 hole starting from the inside of the .812 reamed hole. It was necessary to introduce a guide bushing into this larger hole.

You can't see it in the photograph, but there is a lever controlled by the outside path of the regular feed cam that actuates a vertical ram mounted on the column. This ram holds a guide bushing which is moved directly downward into the .812 hole in the work. As soon as it is in place, the .219 drill drills the angular hole.

Station 6 has two units. Unit 6-A completes the drilling of the .250 hole started at Station 2-A. Unit 6-V with two 10-24 NC taps, performs the tapping operation in the two holes drilled by Unit 1-V.

The work fixture is unclamped automatically as the table indexes to the unloading station.

Each Unit Cost on the drawings includes the cost of the man and of the machine — no power or overhead. We assumed:

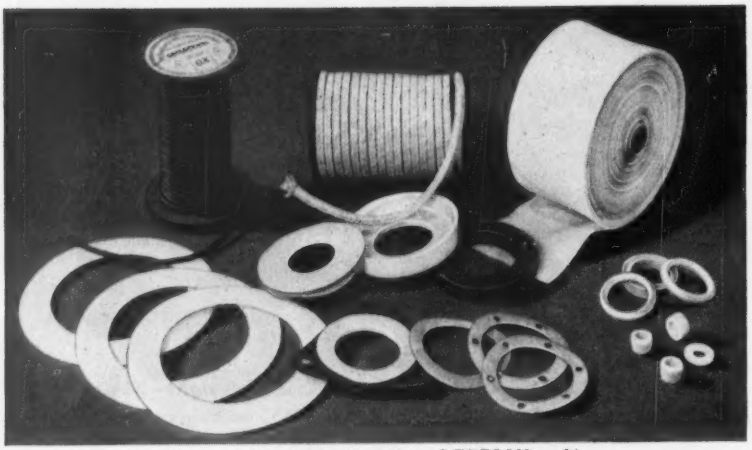
Unit cost of man equal to:

$$\frac{\text{average U. S. hourly wage}}{\text{hourly gross x 80\% efficiency}}$$

Unit cost of machine to be:

$$\frac{\text{price of tooled machine}}{\text{output in 6000 hrs. @ 80\% efficiency}}$$

When it comes to Teflon* PACKINGS and GASKETS come to Garlock...manufacturers of mechanical packings since 1887



Above—A few of the wide variety of TEFLON packings and gaskets manufactured in the Garlock factories.

GARLOCK pioneered in the design and manufacture of packings and gaskets made of TEFLON. Garlock products made of TEFLON are unaffected by acids, organic solvents and other chemicals at operating temperatures from below −90°F. up to 500°F. These packings and gaskets are ideally suited for many other applications due to TEFLON's low coefficient of friction.

We have the facilities to mold, machine, or form TEFLON in a wide variety of shapes and sizes for packing and gasketing. When you need finished TEFLON parts contact your Garlock representative or write for our TEFLON Catalog.

THE GARLOCK PACKING COMPANY
PALMYRA, NEW YORK
In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.

*The DuPont Company's Trademark

GARLOCK

PACKINGS, GASKETS, OIL SEALS,
MECHANICAL SEALS,
RUBBER EXPANSION JOINTS

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American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cosa Corp., 405 Lexington Ave., New York 17 N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

BORING BARS

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Erickson Tools Div., Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Homestrand, Inc., Larchmont, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lovejoy Tool Co., Inc., Springfield, Vt.
Madison Mfg. Co., Muskegon Heights, Mich.
Maxwell Co., 420 Broadway, Bedford, Ohio.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

BORING, DRILLING AND MILLING MACHINES, Horizontal

(Floor, Planer or Table Types)

Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn R. R., Evanston, Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Lucas Mch. Tool Div., New Britain Mch. Co., 12302 Kirby Ave., Cleveland 8, Ohio.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Portage Machine Co., 1069 Sweitzer Ave., Akron 11, Ohio.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.

BORING HEADS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Chandler Tool Co., 514 Ohio Ave., Muncie, Ind.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Maxwell Co., 420 Broadway, Bedford, Ohio.
Mummert-Dixon Co., Hanover, Pa.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

BORING MACHINES

Chandler Tool Co., 514 Ohio Ave., Muncie, Ind.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.

(Continued on page 306)

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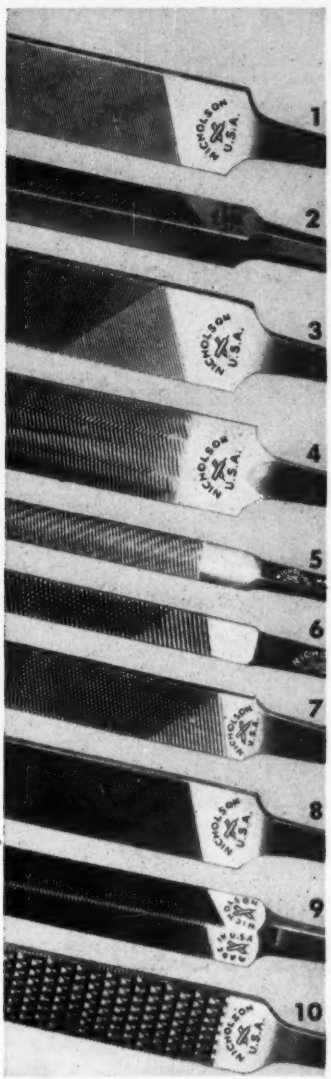


⬅ REGULAR PURPOSE FILES

(1) **MILL**—for smoothing, edge sharpening, large-tooth saw filing.

(2) **TAPER**—Regular, Slim, Extra Slim, Double Extra Slim types—for sharpening hand saws.

(3) **FLAT.** (4) **HALF ROUND.** (5) **ROUND.** (6) **SQUARE.** (7) **PILLAR.** (8) **KNIFE.** (9) **THREE SQUARE.** Mostly double cut—for fast stock removal.

(10) **WOOD RASP**—Flat and Half Round types.

SPECIAL PURPOSE FILES ➡

(11) **G. P. MACHINIST'S**—a special file combining the "General Purpose" principles of both regular Mill and Flat files to give metal-removing speed with smooth finish.

(12) **SUPER-SHEAR**—a patented curved-tooth file with teeth in off-center arcs, for roughing and smoothing in one operation. Serrations break up filings.

(13) **CURVED TOOTH**—rigid tanged type for filing flat surfaces. Flexible type (with holder, not shown) for concave and convex surfaces as well as for larger flat areas.

(14) **LEAD FLOAT**—has coarse, short-angle "blade"-like teeth which shear or "float" away metal. For lead, copper and other soft materials.

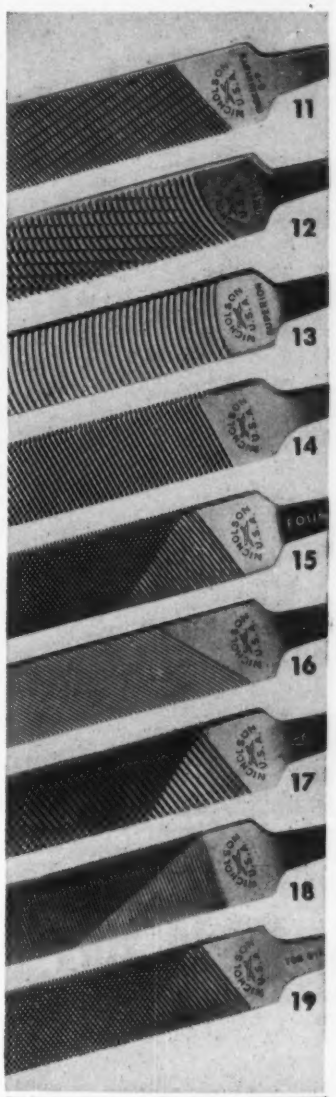
(15) **FOUNDRY**—has extra-rugged teeth to resist breaking out. For fast metal removal on castings.

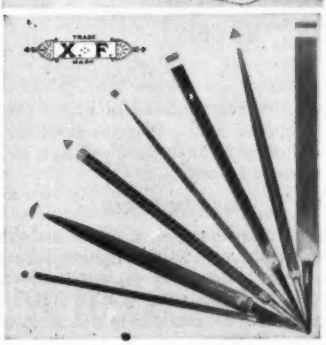
(16) **LONG ANGLE LATHE**—teeth cut for chip clearing and clean shearing—for fast, smooth finishing.

(17) **ALUMINUM TYPE "A"**—special serrated-tooth and "open-throat" cut, to prevent clogging. For aluminum and other ductile metals.

(18) **BRASS**—short-angle "upcut" teeth prevent file running off work and help keep gullets clear of chips. Long-angle "overcut" breaks up filings.

(19) **STAINLESS STEEL**—special-shape teeth to withstand high abrasive action of stainless steel's tough chromium carbides and nickel alloy.





X. F.* SWISS PATTERN FILES

⬅ Hundreds of shapes, cuts and sizes for hand and machine filing of precision tools, dies, fine instruments—all sorts of delicate and intricate pieces. Made to more exacting measurements than American Pattern files—with smaller points, longer tapers, finer cuts. **X.F. means Extra Fine.*

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All popular shapes and head sizes in (1) *Hand-Cut Hi-Speed Steel.* (2) *Ground Burs Hi-Speed Steel,* and (3) *Ground Burs Carbide;* in both ¼" and ⅛" shanks. Accurate cuts and peripheries, true-centered shanks —Nicholson superior quality throughout. ➡

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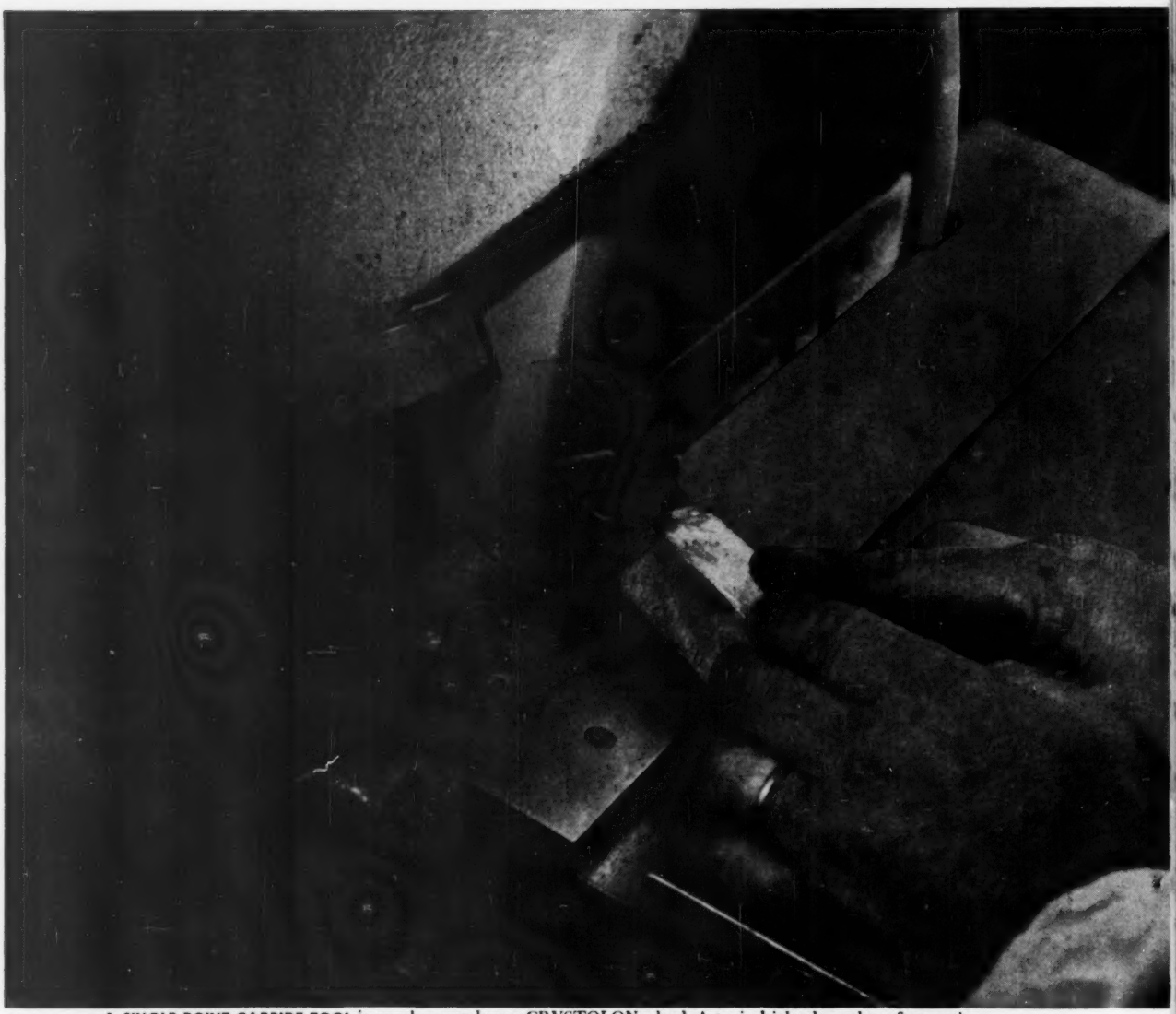


A SINGLE-POINT CARBIDE TOOL is rough ground on a CRYSTOLON wheel. A typical job where these fast-cutting, cool-cutting silicon carbide wheels are proving their worth as cost-cutters.

Add this cost-cutting "TOUCH OF GOLD" to your carbide grinding...

Save your diamond wheels with Norton CRYSTOLON* wheels!

Conserving your diamond wheels during the present serious shortage of commercial diamonds is not only desirable, *it is vital.* Yes, and easy, too. Because:

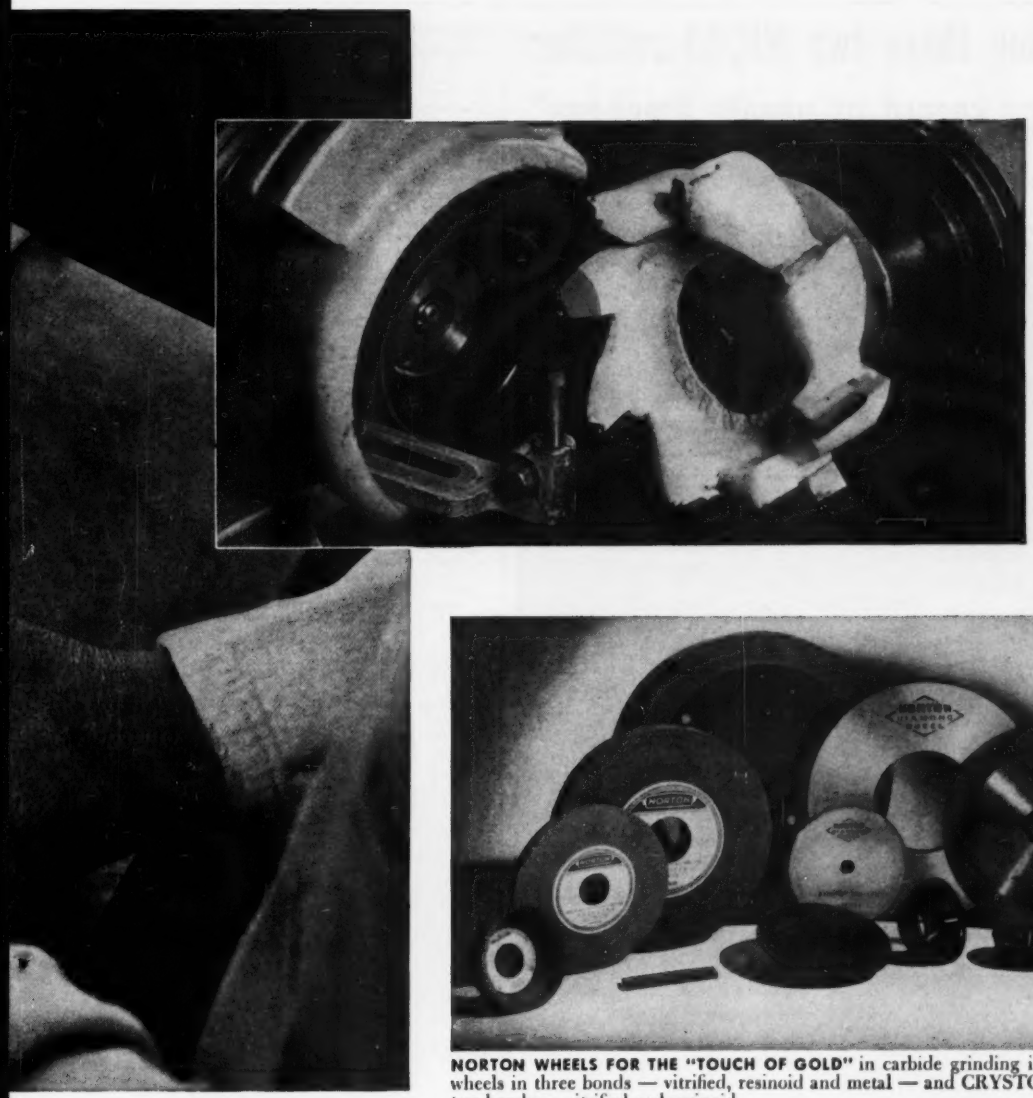
On many carbide grinding jobs Norton CRYSTOLON (silicon carbide) wheels will give you results equally as good as diamond wheels — plus big savings. In fact, the skillful teaming of Norton CRYSTOLON wheels *with* Norton diamond wheels assures you the true, value-adding "Touch of Gold" that means carbide tools at their very best.

Where CRYSTOLON Wheels Save

Recent tests in offhand grinding of single-point tools proved that the relatively slow wear of the diamond abrasive was more than offset by the much lower cost of the silicon carbide abrasive. Net result was that the silicon carbide wheels cost about ⅛ as much to use as the diamond wheels. And a 60 grit silicon carbide wheel gave as fine a finish as a 100 grit diamond wheel!

Many Other Savings

So it is with various other carbide grinding jobs, especially roughing, where you can replace costly diamond wheels with fast, free-cutting CRYSTOLON wheels. They are made in grit sizes up to



CARBIDE TIPS ON A FACE MILL get keen cutting edges on a Norton diamond wheel — the most efficient and economical wheel for multi-point tool grinding.

NORTON WHEELS FOR THE "TOUCH OF GOLD" in carbide grinding include diamond wheels in three bonds — vitrified, resinoid and metal — and CRYSTOLON wheels in two bonds — vitrified and resinoid.

200, resinoid bonded or in our new vitrified K-Bond — which is quality-controlled to produce half-grade increments of wheel hardness, enabling you to "pin-point" your exact specifications.

Of course, for grinding your multi-point carbide tools and similar jobs, you'll still want Norton diamond wheels in the correct bonds and grit sizes. But even here you may sometimes use CRYSTOLON wheels to advantage, especially on carbides used for machining cast iron.

See Your Norton Distributor

for practical aid in selecting the most economical Norton wheels — CRYSTOLON Abrasive or diamond abrasive—for your carbide grinding. That includes calling in your Norton Abrasive Engineer, if necessary, for advice on any tricky grinding problem. Backed by the world's largest manufacturers of abrasives, these Norton team-workers are ready to help you add the product-improving, money-saving "Touch of Gold" to every grinding job you do.

Get These Up-to-the-Minute Facts

Don't miss the December issue of *Grits and Grinds*, the Norton monthly magazine on grinding! It contains no less than three articles on carbide tool grinding by well-known Norton technicians. These expert analyses of the latest tested methods are packed with valuable information on how to cut your grinding costs and improve quality. Write us for your copy, also for these two other booklets on carbide grinding and how to make diamond wheels last longer. NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

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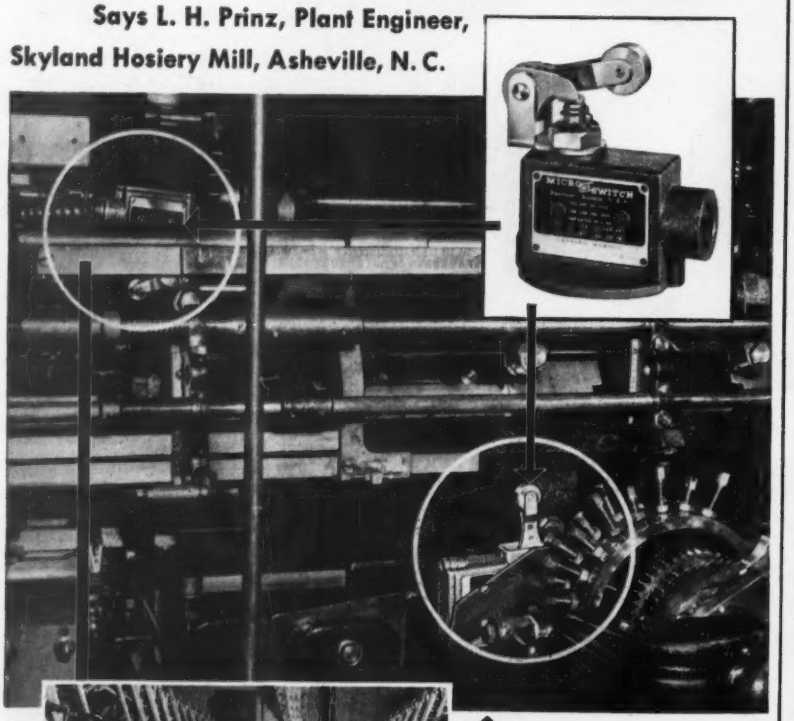
"Since installing these two MICRO switches we have had no record of needle breakage"

Says L. H. Prinz, Plant Engineer, Skyland Hosiery Mill, Asheville, N. C.



Close-up view of the two MICRO switches installed on the carrier rack at the Skyland Hosiery Mill, Asheville, N. C. The switch at the upper left cuts off current in case of misadjustment of the carriage. The lower switch shuts off power if narrowing fingers endanger the needle bed.

View of portion of the Skyland Mill showing plant equipment that has been made safer and more automatic by the use of MICRO precision switches.

● Not only have these MICRO switches prevented needle breakage but, according to Mr. Prinz, they have also reduced the danger of jams on the carrier rack that can cost from $500 to $2000 to repair.

Skyland's engineer installed one switch on the carrier rack in such a way that it stops the machinery at once in the event of any misadjustment or mechanical failure on the part of the carriage. The other switch acts to stop the machinery if the narrowing fingers approach each other so closely as to tear up the needle bed.

Plant engineers in every industry are daily finding more and more uses for MICRO switches as limits, safeties and interlocks to make existing equipment more automatic and more productive.

There is a MICRO authorized distributor located near you with a wide variety of MICRO precision switches from which to select the switches best suited to your equipment needs. Micro engineering service is also available at nearby branch offices to help you solve your switch problems.

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Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kearney & Trecker Corp., Milwaukee, Wis.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.
Wales-Strippit Corp., North Tonawanda, N. Y.

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Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Atrax Co., Newington, Conn.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
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Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
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duMont Corp. (Hand, for keyway cutting), Greenfield, Mass.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

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(Continued on page 310)

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Forcing the Gear on Hoisting Drum of World's Largest Ladle Crane at The Alliance Machine Company

The Alliance Machine Company, Alliance, Ohio, builder of the world's largest cranes, gives credit to the Elmes Inclined Forcing Press shown below for making possible a *50% saving* on gear installation costs.

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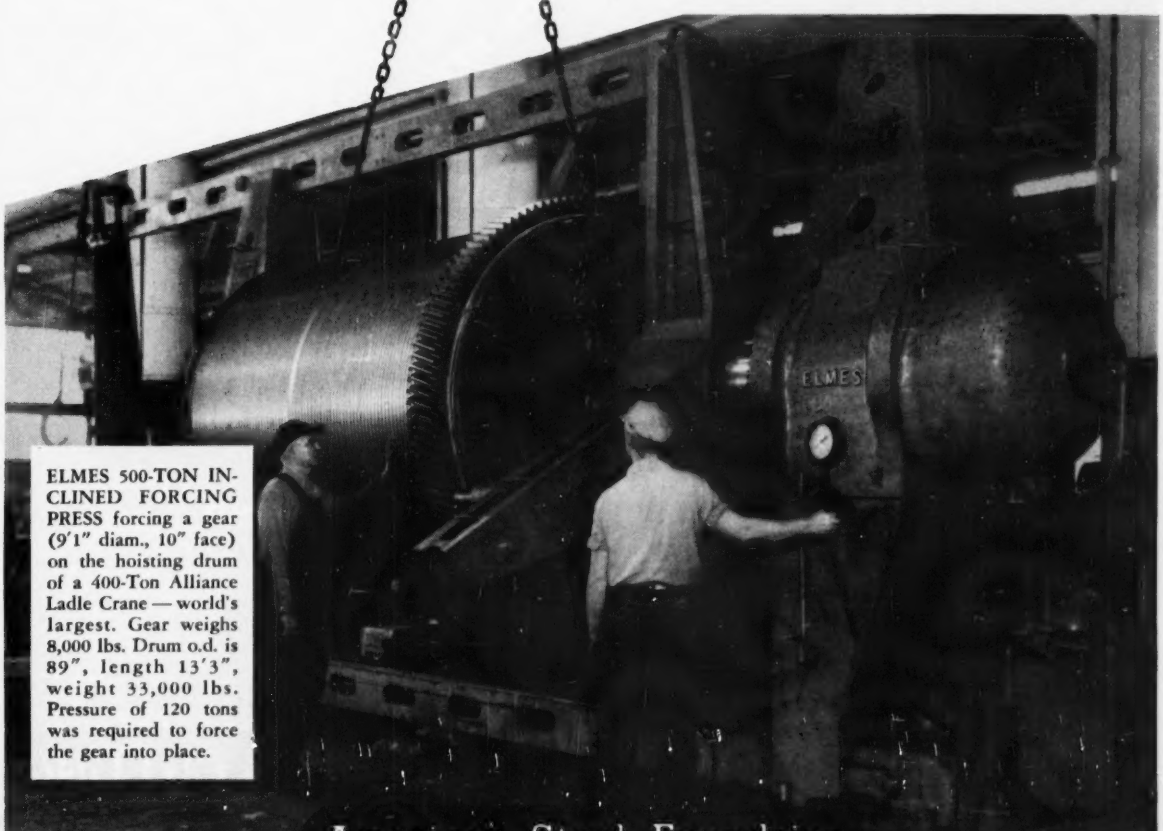
Is your plant doing jobs like these the hard way—the costly way? Why not look into the advantages of an Elmes Forcing Press? They make the tough jobs easy. Your Elmes Distributor can give you details. Write for Elmes Bulletin No. 1055-A. It illustrates and gives major specifications on the complete line of Elmes Hydraulic Forcing Presses . . . Horizontal, Vertical, and Inclined.



ELMES 500-TON INCLINED FORCING PRESS forcing a gear (9'1" diam., 10" face) on the hoisting drum of a 400-Ton Alliance Ladle Crane — world's largest. Gear weighs 8,000 lbs. Drum o.d. is 89", length 13'3", weight 33,000 lbs. Pressure of 120 tons was required to force the gear into place.

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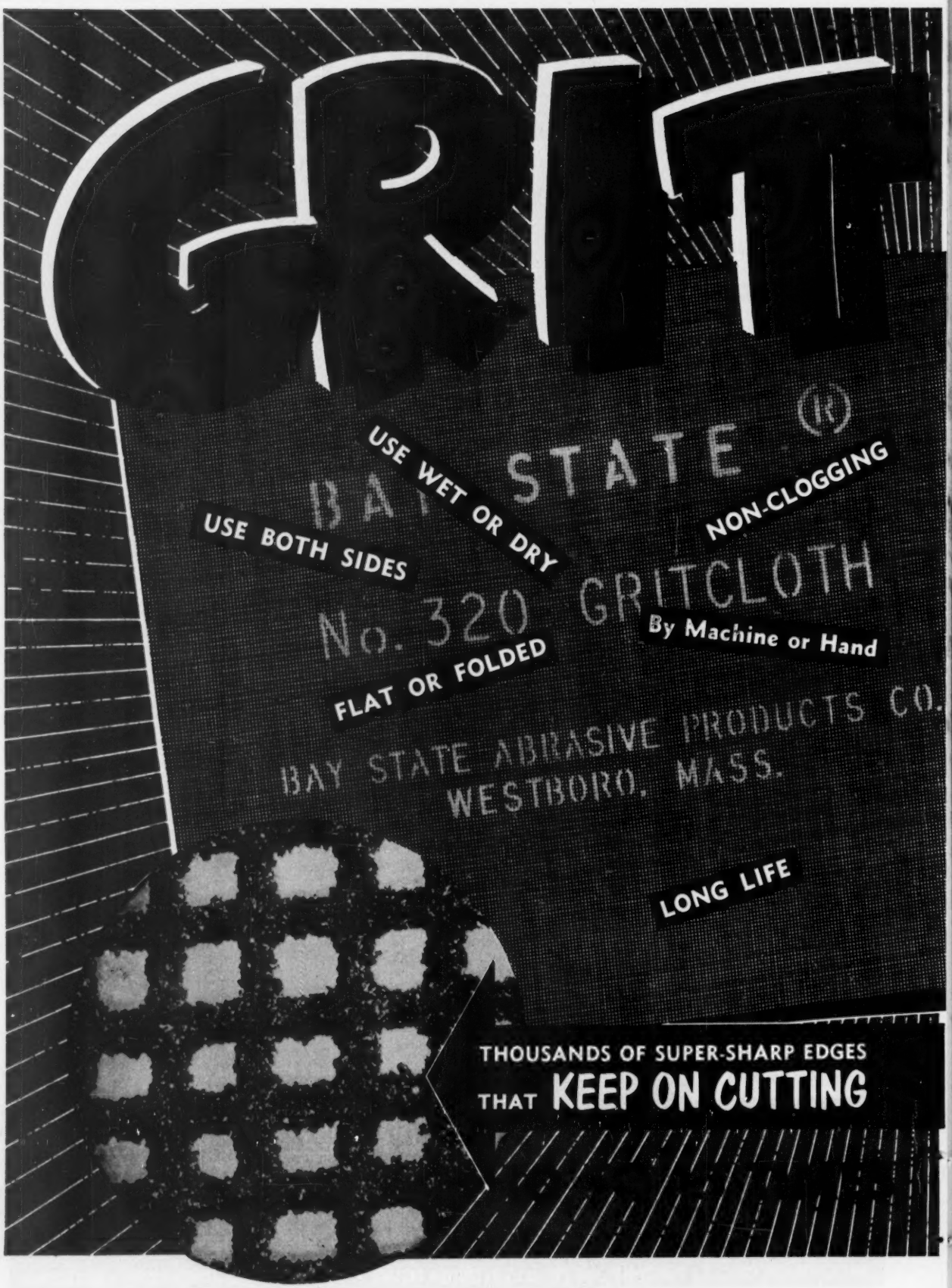
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See Files and Burs, Rotary.

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Johnson Bronze Co., New Castle, Pa.
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Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
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Colonial Bushings, Inc., P. O. Box 37, Harper Sta., Detroit, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
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CABINETS, Tool

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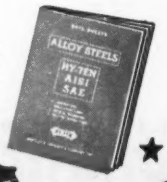
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Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Rowbottom Machine Co., Sheffield St., Waterville, Waterbury, Conn.

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Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Kux Mch. Co., 3930 W. Harrison St., Chicago, Ill.
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Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

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Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
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See Furnaces, Heat-Treating.

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Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.

CASTINGS, Die

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American Brass Co., Waterbury 20, Conn.
Madison-Kipp Corp., Madison, Wis.

CASTINGS, Iron

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Chambersburg Engineering Co., Chambersburg, Pa.
Link-Belt Co., 180 W. Duncannon Ave., Philadelphia 20, Pa.

CASTINGS, Steel, Alloys, Etc.

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Lebanon Steel Foundry, Dept. J, Lebanon, Pa.
Link-Belt Co., 180 W. Duncannon Ave., Philadelphia 20, Pa.
U. S. Steel Corp., Columbia Steel Co., Div., 436 7th Ave., Pittsburgh, Pa.

CEMENT, Disc Grinding Wheel

Besly-Welles Corp., Beloit, Wis.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

(Continued on page 314)

ARE YOU GETTING ALL THESE BENEFITS FROM YOUR CUTTING FLUID?

....LUBRICITY
to withstand pressure and reduce friction

....VERSATILITY
one cutting fluid to do 90% of all jobs

....ANTISEPTIC PROPERTIES
no skin sores, no rancid odors

....FILM STRENGTH
which gives you longer tool life

....COOLER WORK
which can be handled bare-handed

....LOWER COSTS
less than 8¢ a gal., in the machine

YOU GET THEM ALL WITH

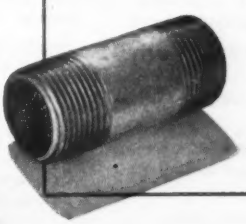
ANTISEP

ALL-PURPOSE BASE

ANTISEP doubles tool life for Portland manufacturer —at 1/5 the cost of oil!

Operation consists of forming, threading and tapping stainless steel pipe nipples from 316, 340 and 303 type steel. This company switched from straight oil—costing 42¢ per gallon—to Antisep A.P. Base mixed one part to 30 with water—at a cost of about 8¢ per gallon.

LATEST REPORT—"Getting better finish—tool life doubled—at 1/5 the cost of oil formerly used." Their operators also like Antisep because there's no smoke and work comes off clean.



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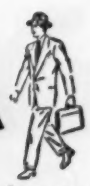

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DELTA MILWAUKEE

QUALITY MAKES THE DIFFERENCE

NOW! 3 Models of

DELTA Drill Units

AIR POWERED–HYDRAULIC CONTROL

A practical, low-cost way to solve machining problems involving drilling, tapping, reaming, spot facing, hollow milling, chamfering, centering, counter-sinking and the like—Use the Delta Drill Unit to devise special tool set-ups that multiply production, break bottle-necks.

Rarely has a new machine achieved success so completely and so quickly as this new Delta air-powered hydraulically controlled Drill Unit.

Thousands of manufacturers, on the alert for ways to get better production faster and at least cost, have won astonishing benefits by means of this adaptable unit—by designing special machines for multiple and series operations.

You'll appreciate "Why" when you check these 12 reasons:

1. Quick set-up. No cams used.
2. Rapid approach and return.
3. Length of approach and total stroke positively controlled.
4. Approach repeats to within .010 inch—final depth to within .0005 inch.
5. Power feed hydraulically controlled . . . independent of motor and spindle speed.
6. Compressed air provides the force on a sealed, pumpless hydraulic system to move spindle forward, completely eliminating lost motion and back lash.
7. Sealed unit construction permits operation in any position.
8. Built-in control switches.
9. Units offered as direct drive, gear drive, or pulley drive.
10. Standard NEMA frame motors.
11. Utter simplicity of operating principle and rugged design insure long, trouble-free service.
12. Operates efficiently at standard plant 80 p.s.i. air pressures.

Three models are now available to meet your specific requirements:

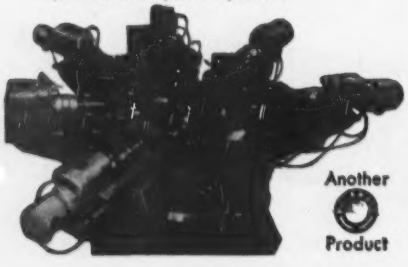
MODEL 19-150 — 1½" stroke. Capacity from No. 80 to 5/16" drill. 4 types of drives.

MODEL 19-400 — 4" stroke. Approximate capacity up to 3/8" drill. 5 types of drives.

MODEL 19-600 — 6" stroke. Approximate capacity 1" drill. 6 types of drives.

See your authorized Delta drill unit dealer —write for the new catalog.

Eight station, semi-automatic drilling machine built for Badger Meter Mfg. Co. of Milwaukee. This machine drills, counter-sinks and counter-bores over 230 parts per hour. Machine has six working stations, a total of 22 spindles producing 5,000 individual operations per hour.



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ROCKWELL

MANUFACTURING COMPANY

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☐ Please send me catalog AD-723.

☐ Send name of nearest authorized Delta drill unit dealer.

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Position_____

Company_____

Address_____

City_____ Zone____ State_____

CENTERING MACHINES

Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jones & Lamson Mch. Co., Springfield, Vt.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

CENTERS, Lathe

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Houston Grinding & Mfg. Co., 2110 Quitman St., Houston 10, Tex.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CHAINS, Power Transmission and Conveyor

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

CHISELS AND CHISEL BLANKS

Bethlehem Steel Co., Bethlehem, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.

CHUCKING MACHINES

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Goss & DeLeeuw Mch. Co. (Multiple Spindle), Kensington, Conn.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
National Acme Co. (Multiple Spindle), 170 E. 131st St., Cleveland, Ohio.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

CHUCKS, Air Operated

Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif.
Logansport Machine Co., Inc., Logansport, Ind.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Schrader's Son, A., 470 Vanderbilt Avenue, Brooklyn, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Tomkins-Johnson Co., Jackson, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Collet or Split

See Collets.

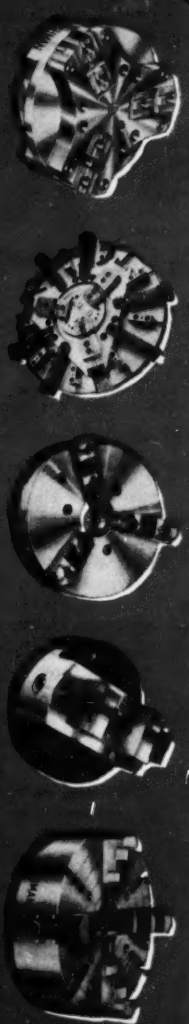
CHUCKS, Diaphragm

Van Norman Co., 2640 Main St., Springfield 7, Mass.

(Continued on page 316)

CUSHMAN

PROUDLY ANNOUNCES AN IMPORTANT ADDITION TO AMERICA'S LARGEST PRECISION CHUCK MANUFACTURING FACILITY



These "Vital Statistics" mean . . . increased production . . . better service for our customers . . . better preparedness to meet defense needs.

Additional shop floor area increases the potential over-all output approximately 40%.

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A WORLD STANDARD FOR PRECISION

...the word from the wise in milling cutter circles

The modern Lovejoy line of inserted-tooth milling cutters are ordered and reordered on the basis of performance. Proof? . . . our first customers are still with us after 30 years of satisfaction.

The modern Lovejoy line has never been more complete. Improved new designs, both standard and special, are coming constantly from our large engineering staff.

The modern Lovejoy line features the exclusive "positive-locking" device to allow maximum use of each blade and minimum loss in sharpening.

The modern Lovejoy line of milling cutters, boring tools, arbors, flywheels, etc., plus outstanding field service, can help you cut your production costs, just as it has for others.

129 MAIN ST., SPRINGFIELD, VERMONT

WRITE FOR FREE CATALOGS

LOVEJOY TOOL COMPANY, INC.

CHUCKS, Drill

Erickson Tool Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

CHUCKS, Full Floating

Erickson Tools Div., Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y.
Gisholt Mch. Co., Madison 10, Wis.

CHUCKS, Gear

Horton, E., & Son Co., Windsor Locks, Conn.

CHUCKS, Lathes, Etc.

Buck Tool Co., 220 Schippers La., Kalamazoo, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Erickson Tools Div., Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Gisholt Mch. Co., Madison 10, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
Horton, E., & Son Co., Windsor Locks, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Magnetic

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Hanchett Magna-Lock Corp., Big Rapids, Mich.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

CHUCKS, Power Operated

Skinner Chuck Co., 344 Church St., New Britain, Conn.

CHUCKS, Quick Change and Safety

Erickson Tools Div., Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Jarvis, Charles L., Co., Middletown, Conn.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.

CHUCKS, Ring Wheel

Gardner Mch. Co., Div. Landis Tool Co., 414 E. Gardner St., Beloit, Wis.

CHUCKS, Tapping

Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Homestrand, Inc., Larchmont, N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.

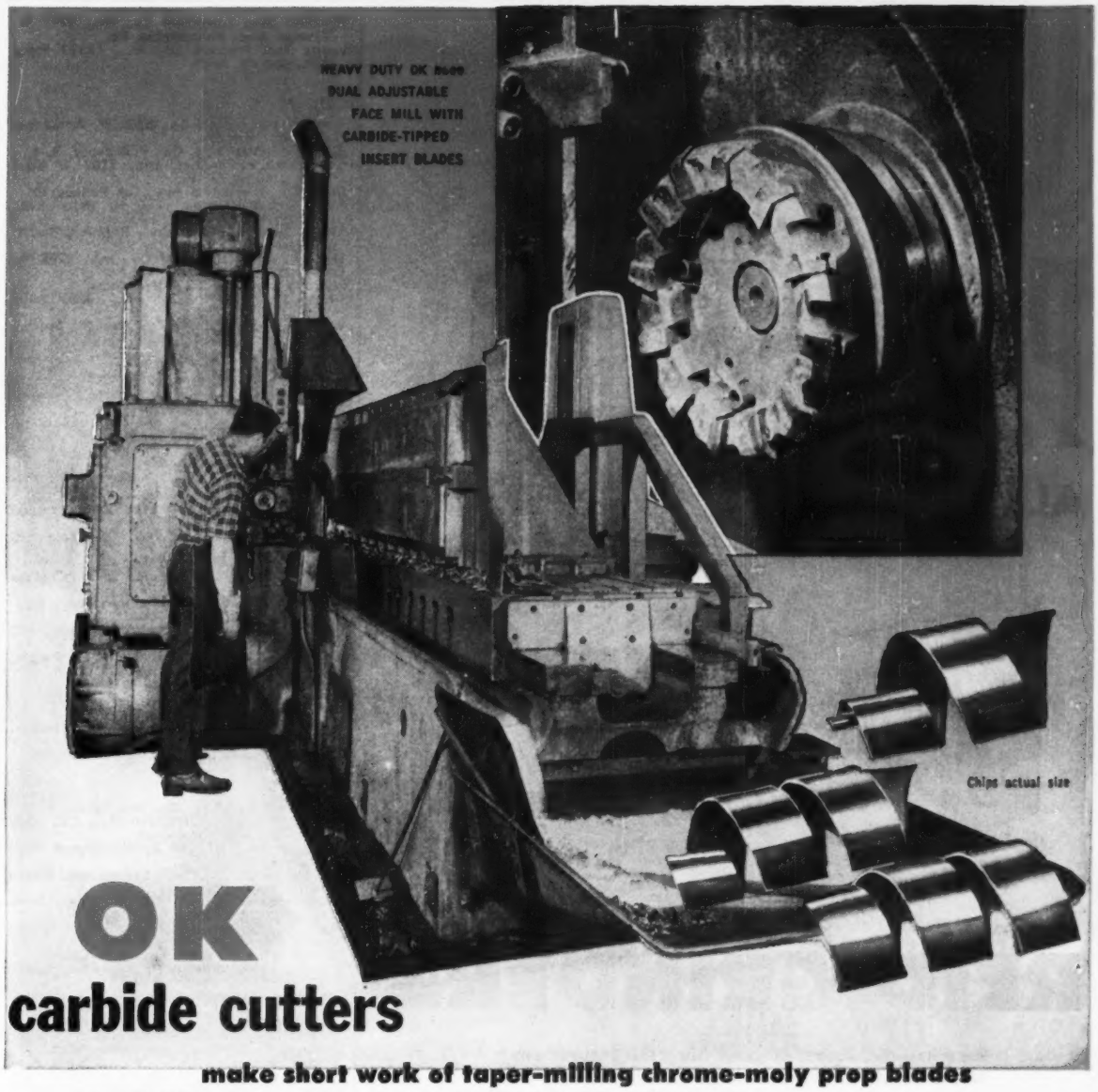
CIRCUIT-BREAKERS

General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

CLAMPING APPLIANCES FOR MACHINE TOOLS

Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.

(Continued on page 318)



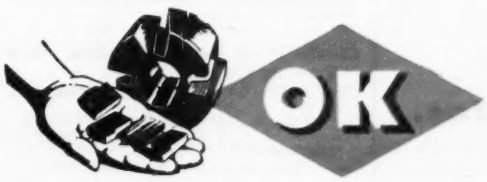
OK carbide cutters

make short work of taper-milling chrome-moly prop blades for B-36 Bombers at Curtiss-Wright Caldwell plant

Here is a good example of how progressive management speeds up heavy milling operations with carbide cutters. The machine is a high powered planer-type miller with mechanical feed and magnetic chuck. The cutter is a heavy duty OK 8600 dual adjustable carbide face mill. Work pieces are tough chrome-molybdenum steel 25" x 123" x .800" for C-W hollow propeller blades for famous B-36 Intercontinental Bombers. Each plate is taper milled for a distance of 107 inches, above and below center rib, the depth of cut increasing from zero to .390 inches. The lower half is milled on the forward stroke and the upper half is milled on the reverse stroke, at the rate of 23 inches per minute. A movie of this operation dramatically shows chips piling on the magnetic chuck and presto! . . . they drop when chuck is demagnetized.

OK carbide milling cutters are built for solid performances like this. They have the strength of simple construction – two-piece body and wedge-shape blades. Mating serrations insure blade security and provide for blade advancement to compensate for wear. No locks, wedges or screws weaken or mar the streamline design. With more beef in the body, OK cutters can better stand the terrific pressures of modern high speed milling.

If you have a milling problem, you should have OK catalog 13. An OK engineer will be glad to give the benefit of our experience over the past 50 years.



modern milling cutters for modern milling machines

THE OK TOOL COMPANY, Milford, New Hampshire

VISIBLE and PROTECTED

ALL ELECTRIC CONTROLS

Another EXCLUSIVE FEATURE *of*

REID GRINDERS

REID had the worker in mind when this feature was incorporated. *Instantly accessible, always visible, constantly protected;* a transparent shatter-proof panel cover keeps out dust and prevents accidental contact. This forward-looking design feature simplifies inspection and adjustment when necessary. (Full J.I.C. controls available for all models)

Every feature of the Model 618-V is made functional by Reid's constant effort to increase precision while simplifying an essential machine tool for easier operation, and improved output.

CAPACITY: 6" x 18" x 15¼"
WORK TABLE: 51" x 8"
POWER FEED, TABLE: 12-35 ft./min.
STANDARD WHEEL: 7" x ⅓" x 1¼"
FLOOR SPACE: 70" x 36"
WEIGHT: 2,000 lbs., crated 2,225 lbs.

For more features *of value to you,* write for Bulletin 618-2.

Reid Brothers Company, Inc.

BEVERLY, MASSACHUSETTS

Standard Shop Equipment Co., Inc., 8299 W. Tinicum Ave., Philadelphia, Pa.
Swartz Tool Products Co., Inc., 13330 Foley Ave., Detroit, Mich.

CLAMPS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Mead Specialties Co., 4114 N. Knox Ave., Chicago 41, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Standard Shop Equipment Co., Inc., 8299 W. Tinicum Ave., Philadelphia, Pa.
Starrett, The L. S., Co., Athol, Mass.
Swartz Tool Products Co., Inc., 13330 Foley Ave., Detroit, Mich.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

CLEANERS, Chemical, for Metal

Bullard Co., Bullard-Dunn Process Div., Brewster St., Bridgeport 2, Conn.
Oakite Products, Inc., 19 Rector St., New York, N. Y.

CLUTCHES

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Clearing Mch. Corp., 6499 W. 65th St., Chicago 38, Ill.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Formsprag Co., Ferndale, Mich.
Link-Belt Co., 300 West Pershing Rd., Chicago 9, Ill.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Rockford Clutch Div., Borg-Warner Corp., 410 Catherine St., Rockford, Ill.
Twin Disc Clutch Co., 1361 Racine St., Racine, Wis.

COLLARS, Safety

Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Standard Pressed Steel Co., Jenkintown, Pa.

COLLETS

Brown & Sharpe Mfg. Co., Providence, R. I.
Erickson Tools Div., Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Gisholt Mch. Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Bros., Inc., 1418 College Ave., Elmira N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engrg. Co., Frankenmuth, Mich.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

COMPARATORS

See Gages, Comparator.

COMPARATORS, Optical

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Eastman Kodak Co., Rochester, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., Springfield, Vt.
Portman Instrument Co., Port Washington, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

COMPOUNDS, Cleaning

Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Oakite Products, Inc., 19 Rector St., New York, N. Y.

COMPOUNDS, Cutting, Grinding, Metal Drawing, Etc.

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.

(Continued on page 320)

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Aetna Bearings and Precision Parts are helping equipment do a better job in almost any field you can name. Reason is, designers, engineers, and manufacturers know that nothing contributes more to equipment efficiency and servicability than quality anti-friction components.

Aetna cooperative engineering has successfully solved over 2000 special anti-friction problems for American manufacturers. Tackling such problems and designing special bearings or precision parts to solve them has been a basic part of Aetna's business for more than a third of a century.

As an executive it may pay you handsomely to find out what Aetna products can do to help make your product more useful, easier to sell, or cheaper to make. A letter, wire or 'phone call will place our engineers at your disposal.

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and

SMALL PRECISION GEARS

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Unusual conditions are usual now. You are *expected* to build small, precision mechanisms on fast production schedules. And you will be expected to produce them better and faster tomorrow. But why worry? All you will need will be better machines.

MORALE BOOSTER

And better machines are here *now!* The Hamilton No. I Precision Small Gear Hobber will *solve* your problem in respect to gears. All gears, regardless of shape, if they are small and exact, can be produced faster on the Hamilton No. I.

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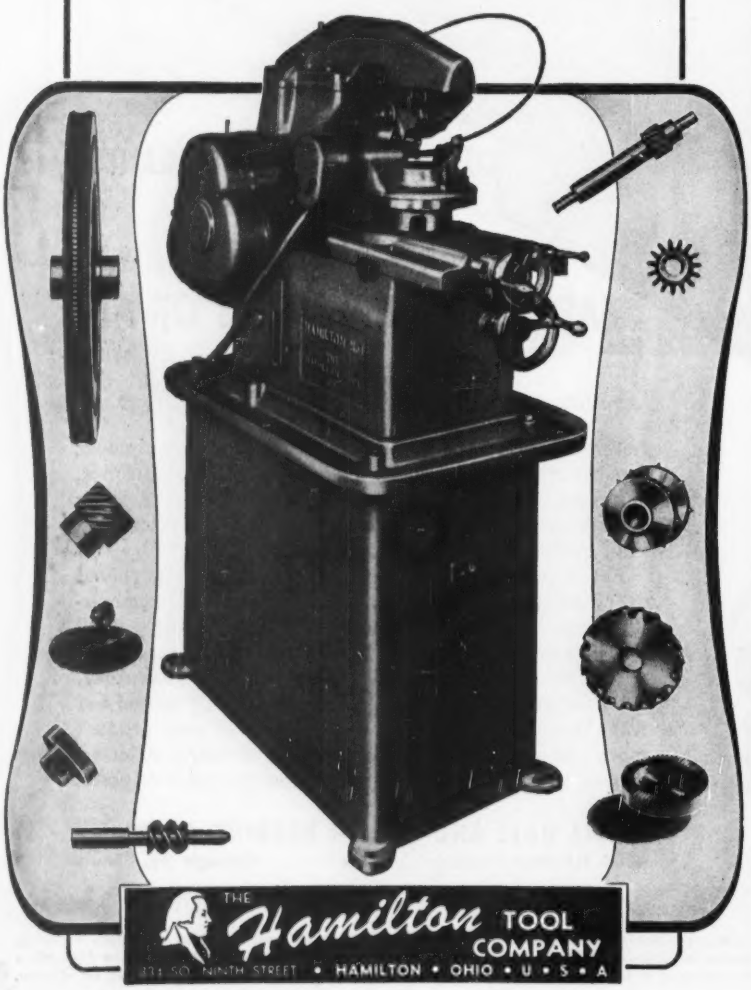
You don't expect full information about such a machine in the small space of one advertisement. But full information is available . . . ten printed pages of it . . . and offered to you free. Write for our Bulletin No. H-492, with supplement. Do it now . . . tomorrow you may need to *know!*



THE Hamilton TOOL COMPANY

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National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Broaching & Lapping).
Oakite Products, Inc., 19 Rector St., New York, N. Y.
Sinclair Refining Co., 630 5th Ave., New York.
Standard Oil Co. (Indiana) 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

COMPOUNDS, Resin and Molding

Bakelite Co. Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
General Electric Co., Schenectady 5, N. Y.

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Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

CONTOUR FOLLOWER

Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Turchan Follower Machine Co., 8259 Livernois and Alaska Aves., Detroit, Mich.

CONTRACT WORK

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
Eisler Engrg. Co., Inc., 760 S. 13th, Newark 3, N. J.
Fellows Gear Shaper Co., Springfield, Vt.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland, Ohio.
Minster Machine Co., Minster, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Mummert-Dixon Co., Hanover, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.

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Bristol Co., Platts Mills, Waterbury, Conn.
General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

CONVEYORS FOR DUST, CHIPS, ETC.

Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

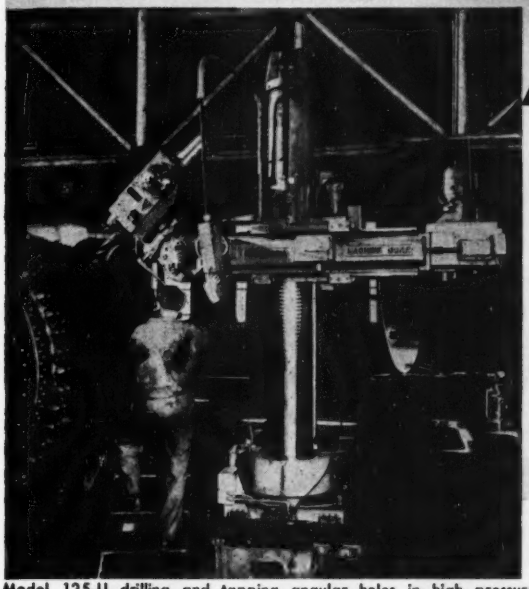
COUNTERBORES

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester Mich.
Pratt & Whitney, West Hartford 1, Conn.

(Continued on page 322)

Kaukauna DRILLING and TAPPING Machines

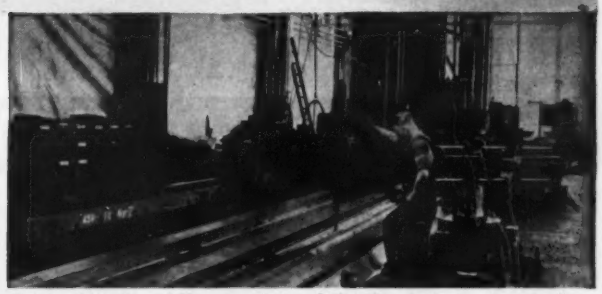
UNIVERSAL AND HORIZONTAL



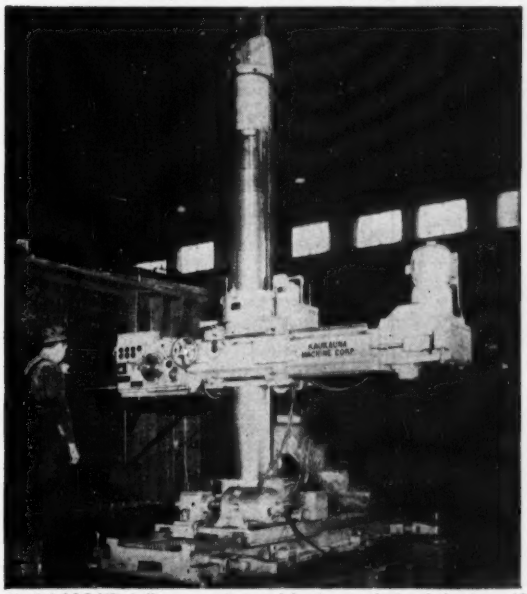
Model 125-U drilling and tapping angular holes in high pressure vessels using a 2¾" drill and a 2½" pipe tap.

PROFIT FROM ANGULAR, VERTICAL AND HORIZONTAL OPERATIONS WITH 1 SETUP

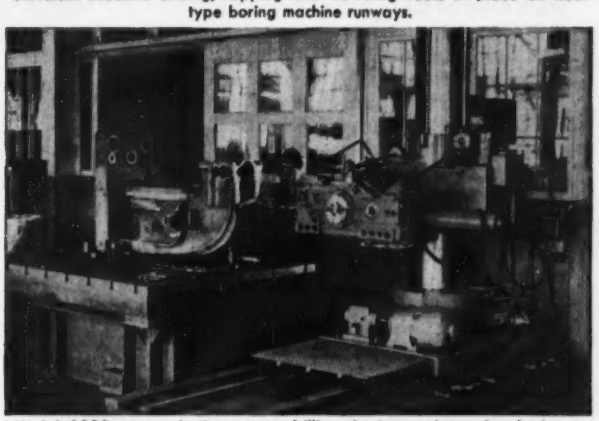
Almost any casting or weldment—of almost any size and shape—can be drilled, tapped or spot-faced in any location accurately, quickly and easily with a KAUKAUNA Machine. Furnished with Universal Head with compound swivels, Tilting Head or Horizontal Head, all with 360° column swivel. Horizontal traverse on runway and vertical traverse on column to suit requirements. For portable or fixed location use.



Universal Machine drilling, tapping and doweling racks in place on floor type boring machine runways.



Model 125-HR drilling, reaming and back spot facing holes in a 40 cu. yd. bucket.



Model 1030 on production setup, drilling, boring and tapping horizontal holes in milling machine bases, columns, headstocks and tables.

Cut your costs on setup time, crane time, fixturing and machine hours. ***Write for Catalog.***

KMC

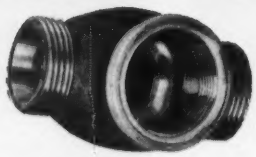
Kaukauna MACHINE CORPORATION

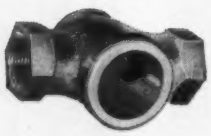
KAUKAUNA, WISCONSIN, U. S. A.

TO CUT PRODUCTION COSTS...

More completely finished parts at the end of the day with no partly finished pieces lying around is the regular accomplishment of Goss & De Leeuw "1-2-3" chuckers. It means complete finishing on one, two or three ends simultaneously or in sequence without tool resetting, rechucking or parts handling. Machining operations may include boring, facing, turning and threading.

Change over from job to job is simple. Cost-cutting is assured on long or short runs. Goss and DeLeeuw Chucking Machines are the only standard machines of their type which operate the "1-2-3" way to reduce costs per piece and step up the number of pieces per hour.





Investigate the opportunities offered by these machines on your production by sending samples of your work for time and cost estimates—Ask for illustrated descriptive literature.

GOSS & DELEEUW
QUALITY PRODUCT-QUANTITY

GOSS and DELEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A

Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Union Twist Drill Co., Athol, Mass.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

COUNTERSHAFTS

Standard Pressed Steel Co., Jenkintown, Pa.

COUNTERSINKS

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Peck, Stow & Wilcox Co, Southington, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.

COUNTERS, Revolution

Bristol Co., Platts Mills, Waterbury, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Millers Falls Co., Greenfield, Mass.
Starrett, The L. S., Co., Athol, Mass.
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

COUNTING DEVICES

Starrett, The L. S., Co., Athol, Mass.
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

COUPLINGS, Flexible

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

COUPLINGS, Shaft

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Standard Pressed Steel Co., Jenkintown, Pa.

CRANES, Electric Traveling

Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Morgan Engrg. Co., Alliance, Ohio.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CRANES, Hand Traveling

Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

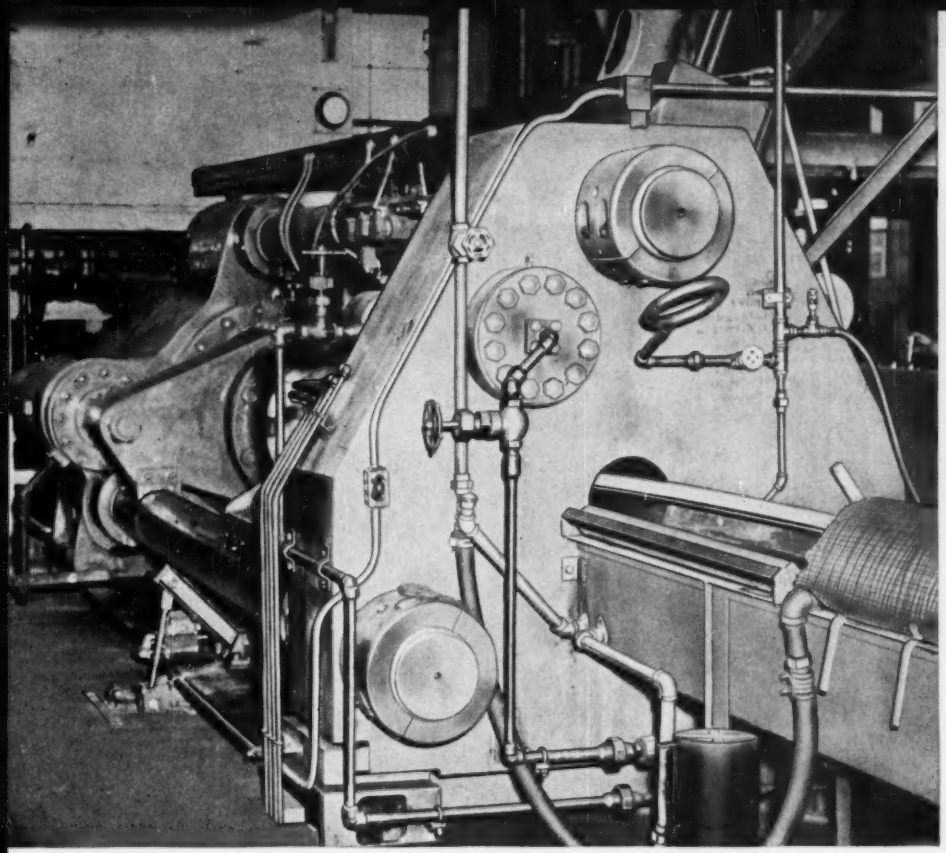
CUTTER GRINDERS

See Grinding Machines, for Sharpening Cutters, Reamers, Hobs, Etc.

CUTTERS, Gear

Brown & Sharpe Mfg. Co., Providence, R. I.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 6, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7173 E. McNichols Rd., Detroit 12, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Shaving).

(Continued on page 326)



Puts squeeze on hydraulic press maintenance...

• Shown above is the 1250-ton hydraulic press used by the Light Metals Corporation of Grand Rapids, Michigan, for extruding variously shaped sections of aluminum. When this press was installed recently, officials gave the important hydraulic oil job to STANOIL Industrial Oil. They based that decision on their own experience with this outstanding oil.

That experience covered over four years' use of STANOIL in the hydraulic system of a 315-ton extrusion press. STANOIL has served continuously in this press without being changed or removed for oil maintenance. The hydraulic oil system has never been cleaned and has remained entirely free from deposits and varnish. Hydraulic operation has been efficient at all times.

The experience of the Light Metals Corporation is your assurance of STANOIL's ability to reduce hydraulic system maintenance to a minimum in your plant. This versatile oil will provide clean, dependable lubrication for such a variety of equipment as air compressors, reduction gears, and electric motors. The Standard Oil lubrication specialists will help you make the most effective use of STANOIL. Phone him at your local Standard Oil (Indiana) office. Or write, Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Ill.

STANOIL
TRADE MARK
Industrial Oil

What's YOUR problem?

D. R. Clay, of Standard Oil's Grand Rapids, Michigan, office, is the lubrication specialist who has helped Light Metals Corporation keep maintenance of hydraulic units at a minimum through use of STANOIL Industrial Oil.

He is one of many Standard Oil specialists located throughout the Midwest. These men have the practical experience and special training to handle lubrication problems on any type of operation.

Take advantage of the service offered by the lubrication specialist nearest your plant. You can contact him easily by phoning your local Standard Oil Company (Indiana) office. With his help, find how many different oils in your plant can be replaced by STANOIL Industrial Oil on such applications as:

Air compressors . . . no sticking or clogging of valves, less oil consumption in splash or circulating systems.

Speed reducers . . . less wear of gears and bearings during frequent cold starts or prolonged high-temperature operation.

Steam turbines . . . freedom from emulsions and sludge, fewer oil changes necessary.

Ring-oiled bearings . . . rings function immediately on starting, less bearing wear.

Circulating and bath systems . . . one oil for a wide variety of jobs.

STANDARD OIL COMPANY STANDARD *(Indiana)*

FORMSPRAG *Full Complement*

FORMSPRAG CLUTCHES have a wide range of sizes and applications

Smallest Formsprags are used in DITTO office machines

Backstop in DODGE MFG. CORP. Speed Reducers

In the feed mechanism of Diebel DI-MATIC Presses

In PACKARD'S famous Ultramatic Transmission

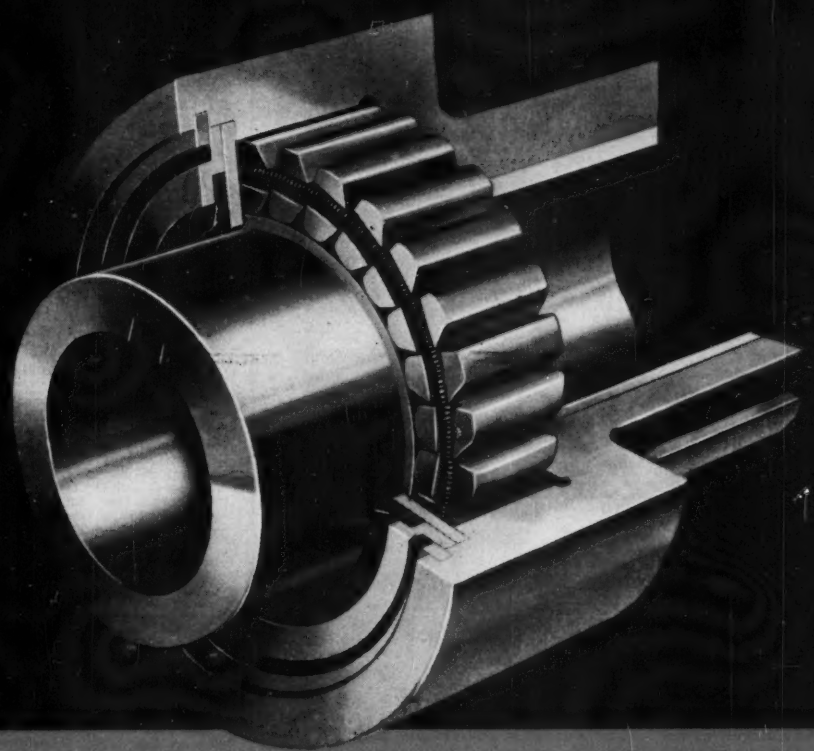
Largest Formsprags are in clutches for oil well rigs

MANY STANDARD SIZES STOCKED BY DISTRIBUTORS IN PRINCIPAL CITIES

SPRAGS USED IN FORMSPRAG OVER-RUNNING, INDEXING AND BACK-STOPPING CLUTCHES

WHAT THEY ARE: Originally sprags were simply pieces of wood used to keep a wagon wheel from rolling backward down an incline. **HOW THEY ARE MADE:** Sprags are made of hardened alloy steel formed to scientifically-determined and time-tested contours. Shown above are five standard sizes. **WHAT THEY DO:** When assembled in full complement in a Formsprag clutch, they grip at an infinite number of positions without backlash.

Over-Running CLUTCHES



Greatest Possible Torque Capacity for Size and Weight

The Formsprag Clutch consists of cylindrical inner and outer members completely filled with spring-energized sprags. It's a full complement clutch. Torque is delivered through many points of contact. Once the torque is removed, the sprags release — instantaneously.

FORMSPRAG DESIGN IS SIMPLE.
There are only four basic parts:

1. **Outer housing**
2. **Inner race**
3. **Full complement of sprags**
4. **Energizing springs.**

Before you specify another clutch, be sure to read this folder!

FORMSPRAG
Company

Designs are available for Balansprag and Cagedsprag Over-Running Clutches

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FORMSPRAG:
Send the folder to:

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TITLE_____

COMPANY_____

ADDRESS_____

In one operation, this Farquhar Hydraulic Press forms straight mild steel bars into elevator brackets—at closer tolerances than any former method.

OTIS ELEVATOR COMPANY *boosts production, slashes time and labor costs in half, with this*

FARQUHAR HYDRAULIC PRESS

In forming lengths of mild steel, the Otis Elevator Company, world's largest elevator and escalator manufacturer, would heat steel and bend it while it was hot. Trying to improve on this system, Otis Production Engineers developed a cold bending process. Farquhar Engineers were contacted, and a 250 Ton "Bulldozer" Horizontal Press was recommended and installed. By bending the steel bars cold in the Bulldozer, Otis has effected a 50% increase in production alone! Time and labor costs have been reduced an estimated 33⅓%! In addition, the Bulldozer operates at closer tolerances than the old heat and bend method. All this, 8 hours a day, 5 days a week, with maintenance costs that Otis terms "negligible."

Farquhar Presses Cut Your Costs

Just one more example of cost-cutting Farquhar performance in heavy production! Farquhar Presses are built for the job . . . assure faster production due to rapid advance and return of the ram . . . greater accuracy because of the extra guides on the moving platen . . . easy, smooth operation with finger-tip controls . . . longer life due to positive control of speed and pressure on the die . . . long, dependable service with minimum maintenance cost!

Farquhar engineers are ready to help solve whatever production problem you may have. Your request will bring them running . . . at no obligation, of course.

Send for free catalog showing Farquhar Hydraulic Presses in all sizes and capacities for all types of industries. Write to: A. B. FARQUHAR Co., Hydraulic Press Department, 1504 Duke St., York, Pa.

Farquhar
HYDRAULIC PRESSES
for Bending • Forming • Forcing • Straightening • Assembling • Drawing
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National Twist Drill & Tl. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.
Waltham Mch. Wks., Newton St., Waltham, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Keyseater

Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.
duMont Corp., Greenfield, Mass.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Wesson Co, 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Milling

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Atrax Co., Newington, Conn.
Barber-Colman Co., Rock St., Rockford, Ill.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kennametal, Inc., Latrobe, Pa.
Lovejoy Tool Co., Inc., Springfield, Vt.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tl. Co., Rochester, Mich.
O. K. Tool Co., Wilton, N. H.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

CUTTERS, Rotary

See Files and Burs, Rotary.

CUTTING COMPOUNDS

See Compounds, Cutting, Grinding, Etc.

CUTTING AND GRINDING FLUIDS

Cimcool Div., Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
DoAll Co, 254 Laurel Ave., Des Plaines, Ill.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Sinclair Refining Co., 630 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

CUTTING-OFF MACHINES

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.

(Continued on page 328)

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—SO EFFECTIVE
—SO EASY TO USE
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EXCLUSIVE MEAD DESIGN ASSURES TROUBLE-FREE OPERATION

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The adaptability of *standard* Twin Disc Machine Tool Clutches to a wide variety of industrial applications has led leading machine tool designers to *demand* them—leading users to *expect* them.

Twin Disc Machine Tool Clutches are demanded because . . . where tough work cycles are figured in fractional seconds . . . they deliver *split second* engagement and disengagement repeatedly, smoothly and accurately—and maintain high torque capacity and clamping efficiency throughout their long wear life.

Twin Disc Machine Tool Clutches are *standard* in leading makes of machine tools the world over. They are available in oil and dry type, single and duplex, in sizes from 3″ to 12″, and with torque capacities up to 2355 foot-pounds.

Write for Bulletin No. 134-B, which gives complete data on the Twin Disc Model MTS and Model MTU Machine Tool Clutches, or ask your nearest Factory Branch for assistance.

Built for a Long Life . . .
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Consolidated Mch. Tool Co., Rochester, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Landis Machine Co., Waynesboro, Pa. (Pipe).
Modern Machine Tool Co., 601 S. Water St., Jackson, Mich. (Lathe Type for Tubing).

CUTTING-OFF MACHINES, Abrasive Wheel

Campbell Mch. Div., American Chain & Cable, 929 Conn. Ave. Bridgeport Conn.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.

CUTTING-OFF MACHINES, Cold Saw

See Sawing Machines, Circular.

CUTTING-OFF MACHINES, Metal Band Saws

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Grob Bros., Grafton, Wis.

CUTTING-OFF TOOLS

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Luers, J. Milton, 12 Pine St., Mt. Clemens, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

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Bay State Abrasive Co., Westboro, Mass.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Norton Co., 1 New Bond St., Worcester, Mass.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.

CYLINDER BORING MACHINES

Baker Bros., Inc., Sta. F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Moline Tool Co., 102 20th St., Moline, Ill.

CYLINDERS, Air

Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Tomkins-Johnson Co., Jackson, Mich.

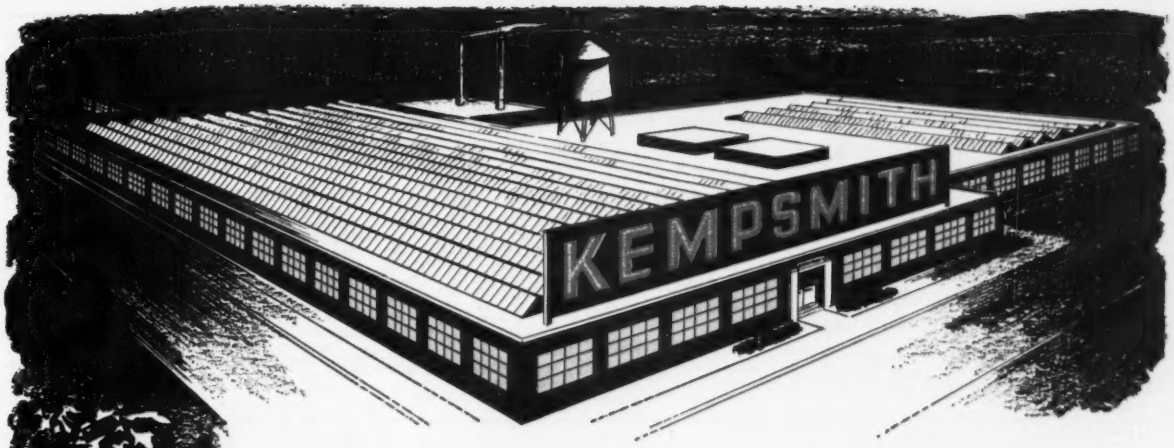
CYLINDERS, Hydraulic

Barnes, John S. Corp., Rockford, Ill.
Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Logansport Machine Co., Inc., Logansport, Ind.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Tomkins-Johnson Co., Jackson, Mich.

DEALERS, Machinery

Botwinik Bros. of Mass., Inc., 14 Sherman St., Worcester, Mass.
Earle Gear & Mch. Co., 4707 Stenton Ave., Wayne Junction, Philadelphia 44, Pa.

(Continued on page 330)



A Leadership Backed by More than 64 Years of Milling Machine History

Back in 1888, Kempsmith Engineers developed and produced the first Kempsmith Miller — a machine that was destined to achieve world-wide fame. The successful performance of this early model encouraged important engineering improvements and refinements resulting in much greater speed and precision in milling operations. Today, Kempsmith continues as a leader in the industry. The ruggedness, precision and ability to take heavy cuts smoothly make Kempsmith Milling Machines ideal for production, toolroom or general purpose milling. If you have a milling problem, consult Kempsmith. Our engineers will gladly give you the benefit of their broad experience in this specialized field.

THE KEMPSMITH MACHINE CO.
MILWAUKEE 14, WISCONSIN, U. S. A.

Kempsmith Type "G" Plain Miller. All geared for positive power and smooth cutting, free from chatter. Note rugged, streamlined appearance. All controls are grouped within easy reach of the operator. Available in No. 1, 2 and 3 sizes, plain and universal models.

Let the chips fly! Kempsmith Millers have what it takes for tough production battles — built-in ruggedness, increased range of speeds and feeds, greater power. Every machine is precision-built, the product of 64 years of milling machine experience.

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A-7270-1PC

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Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.

DEMAGNETIZERS

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Heald Mch. Co., 10 New Bond St., Worcester 6, Mass.
Walker, O. S., Inc., Worcester, Mass.

DESIGNERS, Machine and Tool

Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Pioneer Engrg. & Mfg. Co., 19679 John R St., Detroit, Mich.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

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Precision Diamond Tool Co., 102 South Grove Ave., Elgin, Ill.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.

DIE-CASTING

See Castings, Die.

DIE-CASTING MACHINES

British Industries Corp., International Mchry. Div., 164 Duane St., New York, N. Y.
Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.
Kux Machine Co., 3930 W. Harrison St., Chicago, Ill.
Lake Erie Engineering Corp., Kenmore Station, Buffalo, N. Y.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.

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Clearing Mch. Corp., 6499 W. 65th St., Chicago, Ill.
Dayton Rogers Mfg. Co., 2824 13th Ave., S., Minneapolis 7, Minn.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.

DIE INSERTS, Carbide

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

DIEMAKERS' SUPPLIES

Allied Products Corp., 12677 Burt Rd., Detroit 23, Mich.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Detroit Die Set Corp., 2895A W. Grand Blvd., Detroit 2, Mich.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

DIEMAKING MACHINES

Grob Bros., Grafton, Wis.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kearney & Trecker Corp., Milwaukee, Wis.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

DIE SETS, Standard

Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Detroit Die Set Corp., 2895A W. Grand Blvd., Detroit 2, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
Wales-Strippit Corp., North Tonawanda, N. Y.

DIE-SINKING MACHINES

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Gorton, George, Machine Co., 1110 W. 13th St., Racine, Wis.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.

DIE-SINKING PRESSES

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Kearney & Trecker Corp., Milwaukee, Wis.

DIE STOCKS

See Stocks, Die.

DIES, Lettering and Embossing

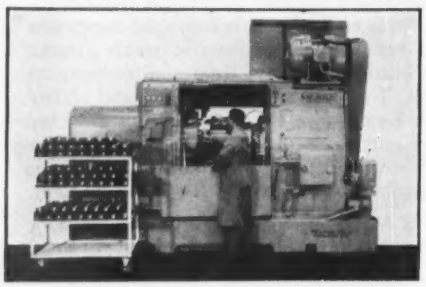
Hoggson & Pettis Mfg. Co., 149 Brewery St., New Haven, Conn.

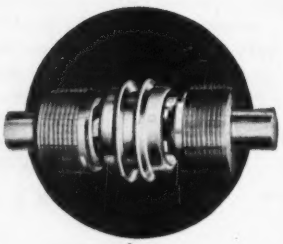
DIES, Sheet Metal, Etc.

Allied Products Corp., 12677 Burt Rd., Detroit 23, Mich.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chambersburg Engrg. Co., Chambersburg, Pa.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.

(Continued on page 332)

This Automatic Chucker Uses





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Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Sheffield Corp., 721 Springfield, Dayton, Ohio
Taft-Peirce Mfg. Co., Woonsocket, R. I.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Verson Allsteel Press Co., 93rd St. and S Kenwood Ave., Chicago, Ill.
Wales-Strippit Corp., North Tonawanda, N. Y.
Waltham Mch. Wks., Newton St., Waltham Mass.

DIES, Threading

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Mansfield, Mass.
Detroit Tap & Tool Co., Detroit, Mich.
Eastern Mch. Screw Corp., New Haven, Conn.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Morse Twist Drill & Mch. Co., New Bedford Mass.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.

DIES, Threading, Opening

Eastern Mch. Screw Corp., New Haven, Conn.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland Ohio.
Sheffield Corp., 721 Springfield, Dayton, Ohio

DIES, Thread Rolling

Detroit Tap & Tool Co., Detroit, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

DISCS, Abrasives

Besly-Welles Corp., Beloit, Wis.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Norton Co., 1 New Bond St., Worcester, Mass.
Simonds Abrasive Co., Tacony & Fraley Sts., Bridesburg, Philadelphia, Pa.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

DIVIDING HEADS

See Indexing and Spacing Equipment.

DOWEL PINS

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Detroit Die Set Corp., 2895A W. Grand Blvd., Detroit 2, Mich.
Producto Machine Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

DRAFTING MACHINES

Universal Drafting Mch. Corp., 7960 Lorain Ave., Cleveland, Ohio.

DRESSERS, Grinding Wheel

Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.

(Continued on page 334)

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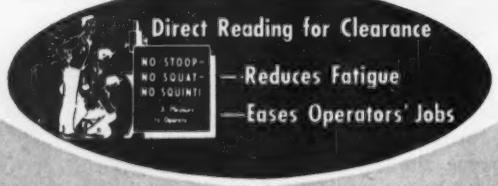

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Meyers, W. F., Co., Bedford, Ind.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Norton Co., 1 New Bond St., Worcester, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.

DRIFTS, Drill

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

DRILL HEADS, Multiple Spindle

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Barnes Drill Co., 814 Chestnut, Rockford, Ill.
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Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.
United States Drill Head Co., 616 Burns, Cincinnati, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILL HEADS, Unit Type

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Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Kingsbury Mch. Tool Corp., Keene, N. H.
Magna Engineering Corp., 110 Linfield Drive Menlo Park, Calif.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

DRILL SOCKETS

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Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

DRILL STANDS

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

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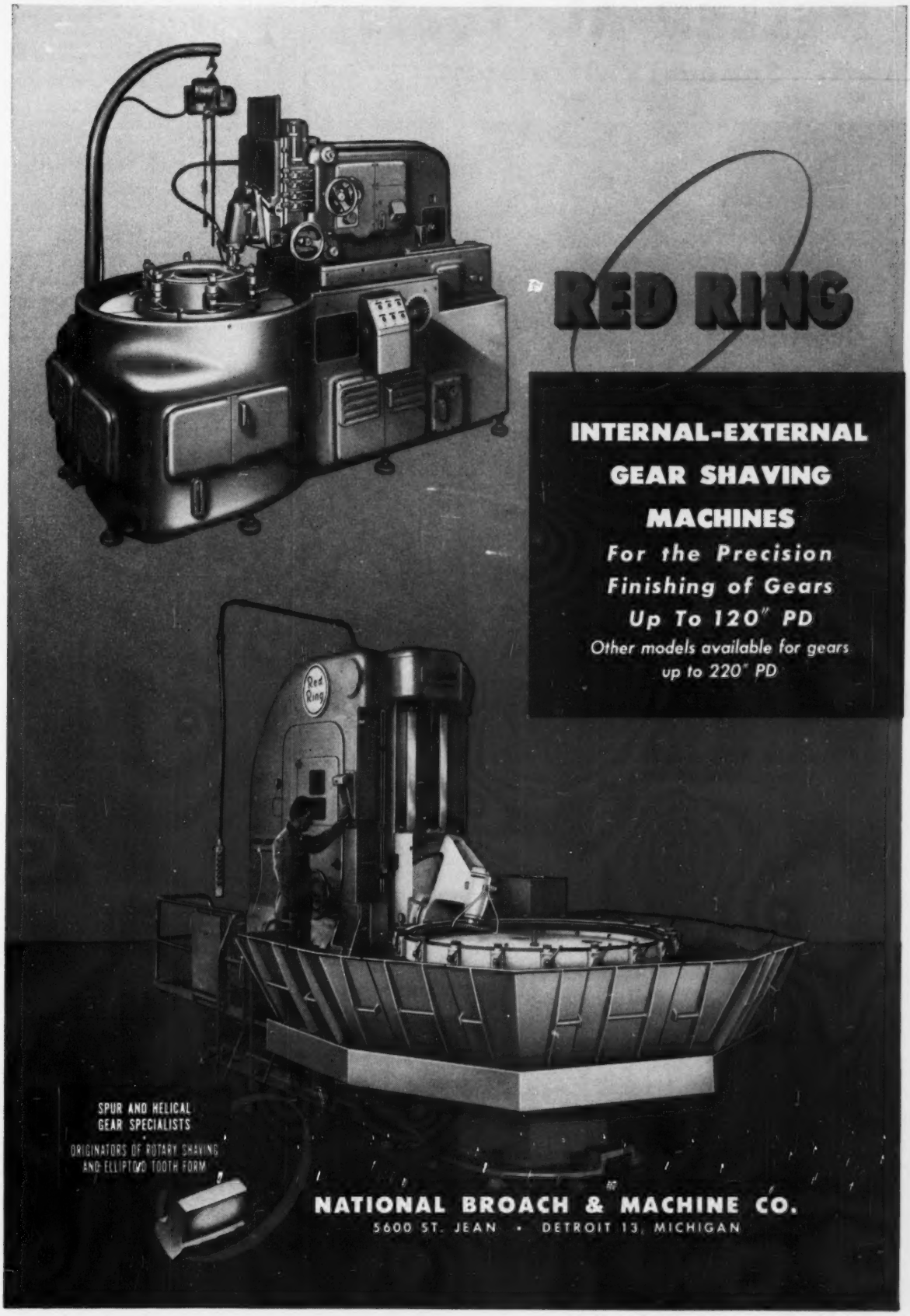
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Snow Mfg. Co., 435 Eastern Ave, Bellwood, Ill.
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Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

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Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
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Dumore Co., 1300 17th St., Racine, Wis.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

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Consolidated Mch. Tool Corp., Rochester, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
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Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
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Consolidated Mch. Tool Corp., Rochester, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Kingsbury Mch. Tool Corp., Keene, N. H.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St, Moline, Ill.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

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Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
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Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Greenlee Bros. & Co., 12th and Columbia Ave., Rockford, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
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Moline Tool Co., 102 20th St., Moline, Ill.
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Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
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(Continued on page 340)

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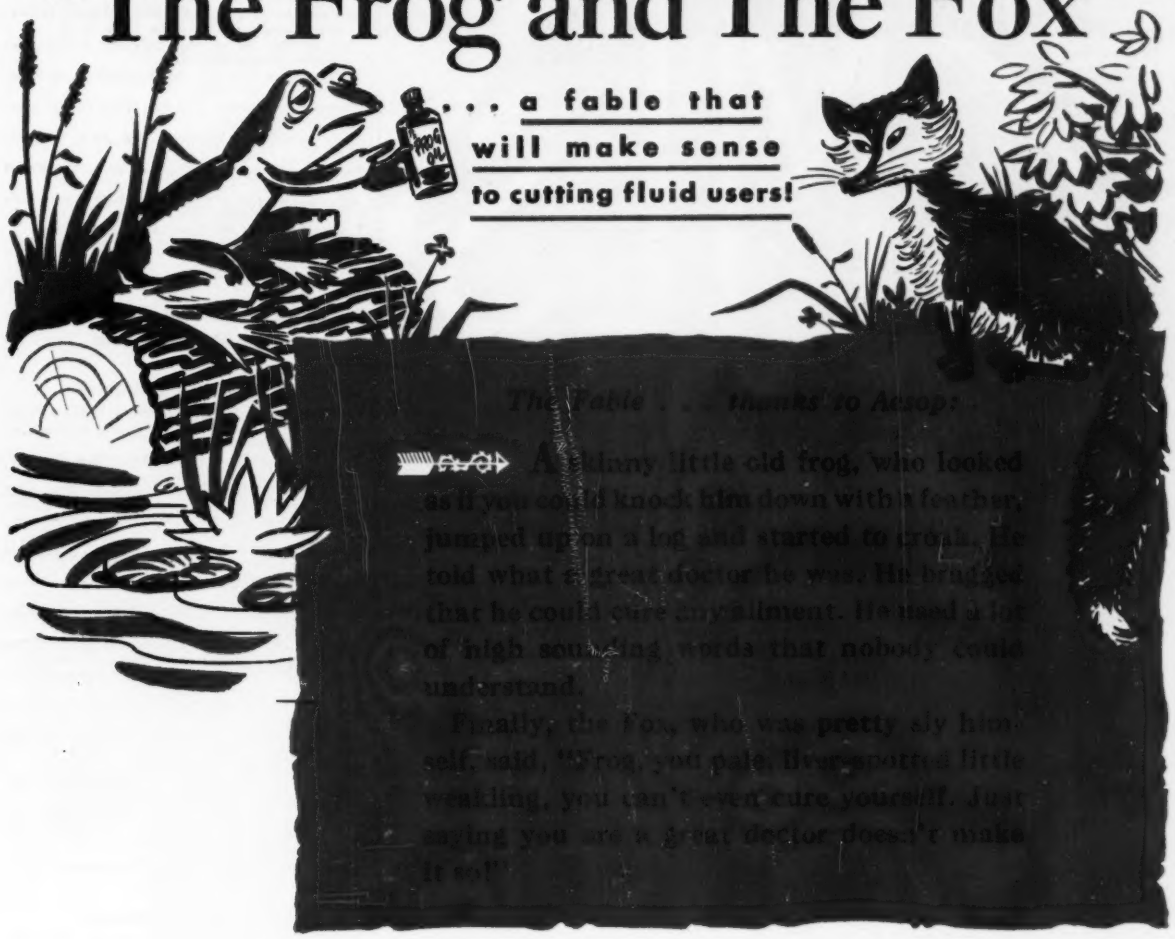

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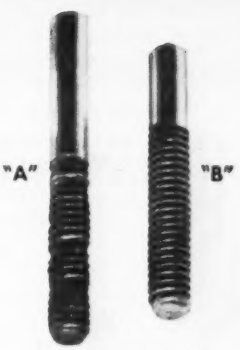
Finally, the Fox, who was pretty sly himself, said, "Frog, you pale, liver-spotted little weakling, you can't even cure yourself. Just saying you are a great doctor doesn't make it so!"

The Sense the Fable Makes:

You are often told that there are miracle-working cutting fluids that will cure all your problems in machining everything from brass to stainless. They often turn out to be like the phoney frog in the fable. Here is an example:

A Stuart Oil customer was using Stuart's SpeedKut B Cutting Oil on his Brown & Sharpe automatics for threading SAE 1020 material. He was induced to try a "do-everything" product on the job. Picture A shows what happened! Picture B shows the same job machined with Stuart's SpeedKut. The "frog oil" didn't have enough cutting value.

Ask to have a Stuart Representative show you how the correct cutting fluid for the job, correctly applied, can save you time, money and material. Use the handy coupon below.



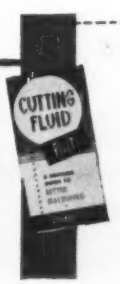
with "frog oil" — with Stuart's SpeedKut B

More Than a "Coolant" is Needed

D.A. Stuart Oil co.
EST. 1865 LIMITED

TIME-TESTED CUTTING FLUIDS AND LUBRICANTS

2739 S. Troy St., Chicago 23, Ill.



CLIP TO YOUR COMPANY LETTERHEAD AND MAIL

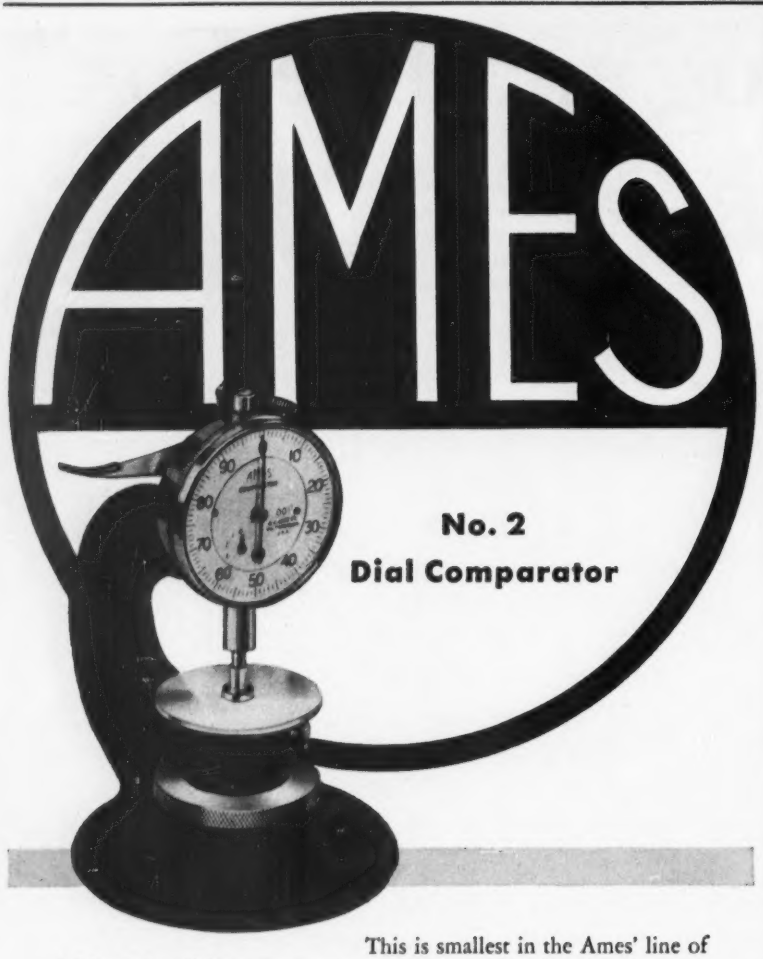
to D. A. Stuart Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.

Please ☐ Have Stuart Representative call

Check ☐ Send Booklet "Cutting Fluid Facts"

Your Name .....

Title .....



This is smallest in the Ames' line of high quality dial comparators and it is ideal for desk or bench use in the fine inspection of small precision parts. It is light in weight, but its broad base makes it very stable. The capacity approximates that of the regularly supplied Ames No. 202 Dial Indicator which has a dial numbered 0-100, graduated in .001" and with a .250" range. Should your job requirements differ, you can have the No. 2 with any Ames "Hundred Series" Dial Indicator. Send for Ames Catalog No. 58 covering the entire line of Ames Top Quality measuring instruments or, better still, send complete details of your Quality Control problem. Ames will suggest a solution – no obligation, of course.

Ames Long Range Dial Indicator No. 2822

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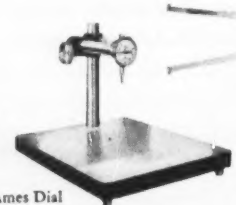
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Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Kaukauna Machine Corp., Kaukauna, Wis.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

DRILLING MACHINES, Rail

See Drilling Machines, Gang.

DRILLING MACHINES, Sensitive

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Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Magna Engineering Corp., 110 Linfield Drive Menlo Park, Calif.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Wales-Strippit Corp., North Tonawanda, N. Y.

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Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Mch. Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Magna Engineering Corp., 110 Linfield Drive Menlo Park, Calif.
Moline Tool Co., 102 20th St., Moline, Ill.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
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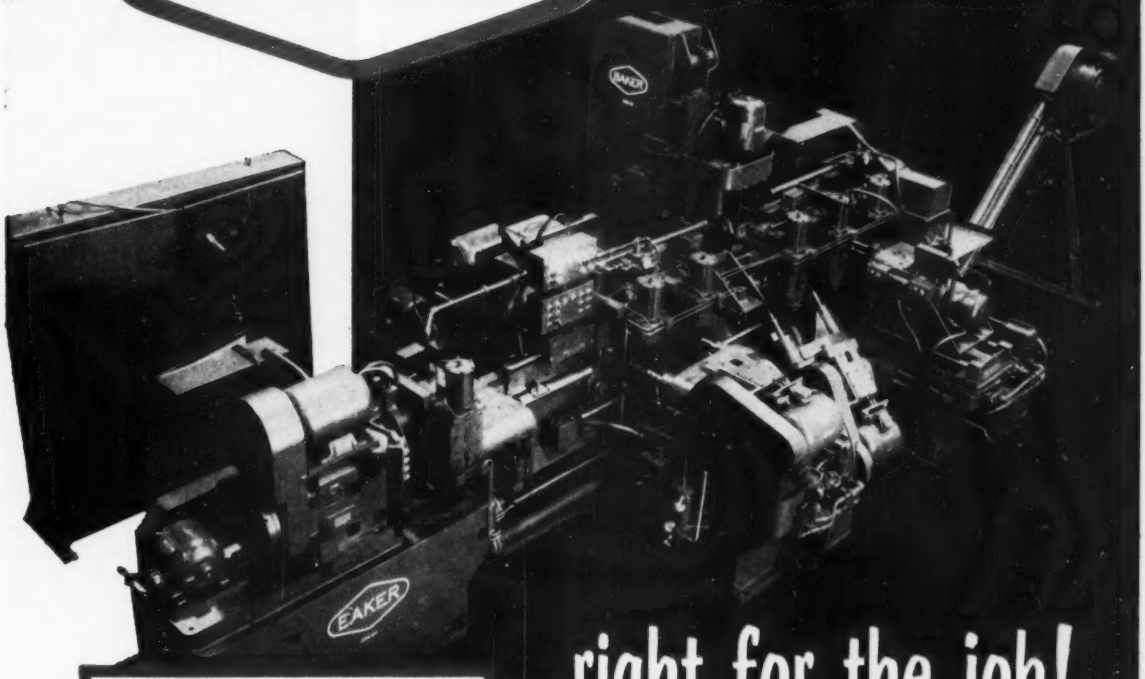
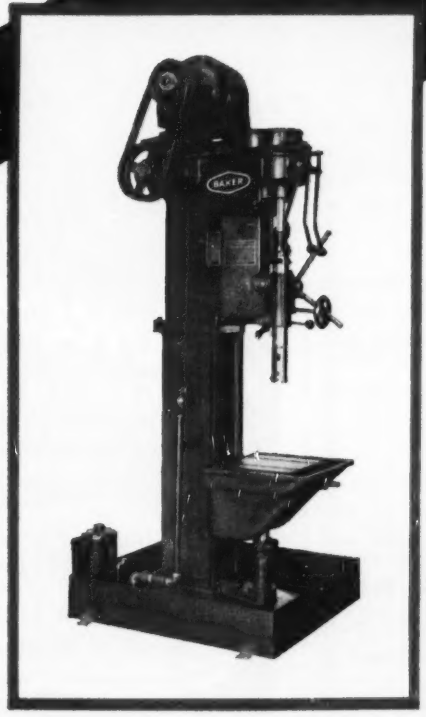
(Continued on page 342)

WHETHER LIGHT or HEAVY..
STANDARD or SPECIAL

BAKER has the drill..



..right for the job!



Regardless of the job requirement, Baker engineers have the know-how to provide drilling machines that will do the job better! Where production figures are of primary importance, Baker will greatly increase productivity . . . and for standard drills over inch and a half capacity . . . there's a Baker *right for every job.* Consult Baker for better drilling machines, no obligation . . . and there is a qualified Baker Sales and Service Representative nearby who is eager to give you prompt and efficient service.

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DRILLING...TAPPING...KEYSEATING and CONTOUR GRINDING MACHINES

since 1931

EFFICIENT USE OF ENGINEERING MANPOWER

There is a sound reason behind the enormous growth of America's independent engineering industry.

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Greenfield Tap & Die Corp., Greenfield, Mass.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

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Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Erickson Tools Div., Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

DRILLS, Deep Hole
Pratt & Whitney, West Hartford 1, Conn.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Union Twist Drill Co., Athol, Mass.

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Black & Decker Mfg. Co., Towson, Md.
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Millers Falls Co., Greenfield, Mass.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

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Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

DRILLS, Ratchet
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.

DRILLS, Twist
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.

(Continued on page 346)

since 1931

AVAILABLE:- HIGH CALIBRE PRODUCTION ENGINEERS

Pioneer has been able to attract and hold the highest calibre production engineers by eliminating the high peaks and deep valleys of employment, substituting variety for repetitiousness, challenges for stagnation.

This is a major reason why Pioneer can so consistently cut both cost and time of re-tooling, improve product designs for easier, lower-cost manufacture and devise new techniques that lower the break-even point.

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for Precision
+ Low Cost:

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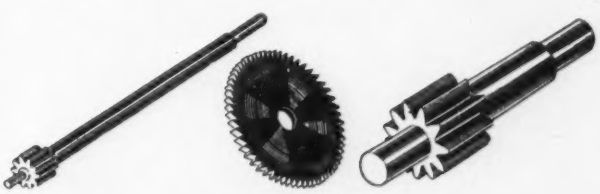
Mikron Hobbing Machines Excel Where High Precision Machining Standards Must Be Maintained.

• **MIKRON No. 79** is an excellent choice for small spur gears and pinions. It is simple to operate, to set-up and to change-over from job to job. **CAPACITY:** Gears, max. dia. 1 9/16″; max. length of cut 1⅛″; number of teeth 6 to 390; pitch DP 26 and finer.



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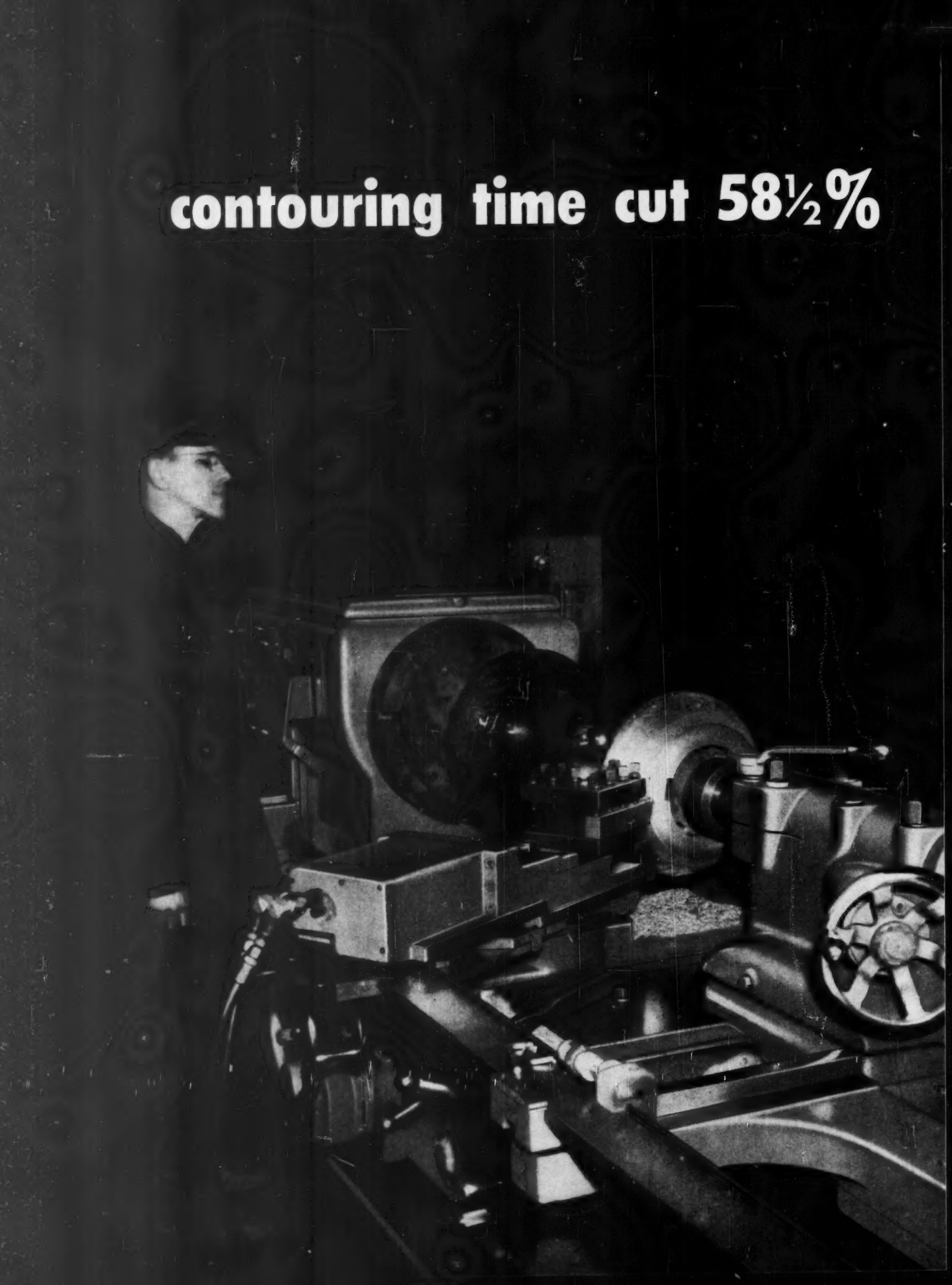
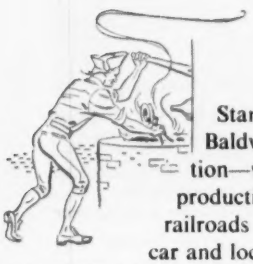
contouring time cut 58½%



with LeBlond Hydra-Trace

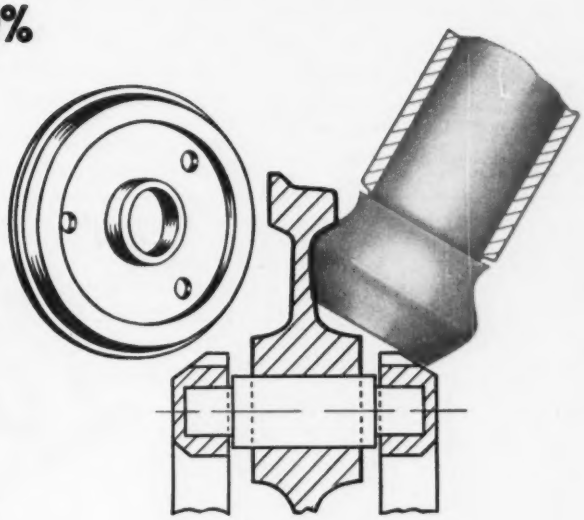
wheel mill roll life boosted 50%



Standard Steel Works Division of Baldwin-Lima-Hamilton Corporation—whose forges first flamed into production in 1795—supplies America's railroads with one-piece, wrought steel car and locomotive wheels. And Standard Steel officials credit LeBlond Hydra-Trace for contributing to their outstanding success in producing these wheels at competitive cost in the quantities needed.

At Standard's Burnham, Pennsylvania Works, rolls of alloy steel are turned to contour and then put to work shaping wheels. The intense pressure and heat of this hot-rolling operation soon work-hardens and wears the rolls out of contour. Formerly a skilled operator—tediously matching contours with a hand-held template—redressed the rolls manually. Four dressings were considered long service for a roll . . . and the work-hardened surface quickly dulled carbide turning tools.

Now, with Hydra-Trace installed on a 25" LeBlond Heavy Duty Lathe, Standard Steel chalks up big savings under all three headings—man hours, material and tool life. As Marty Gotwalt of Swind Machinery—LeBlond's Philadelphia distributor—puts it, "Hydra-Trace automatically keeps the tool just under the work-hardened skin. We've lopped 14 hours off what used to be a 24 hour job."



And that's not all. Minimum metal-removal by the Hydra-Trace method frequently saves Standard's wheel mill rolls for six dressings—*a bonus of two over the manual method.*

Whether your turning problems—like the wheel mill rolls at Standard Steel—center in the toolroom or demand stepped-up output on the production line, Hydra-Trace is ready to help. For all LeBlond Heavy Duty Lathes built since 1935, this template-controlled, hydraulically powered tracer can be mounted in minutes. Templates are flat, compact, and suitable for both rough and finish turning. Call your LeBlond distributor or write

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

Ask for Bulletin HT2D for complete details on LeBlond Hydra-Trace

turned faster by

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WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 64 YEARS*

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See Dressers, Grinding Wheel.

EMERY WHEELS

See Grinding Wheels.

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Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.

EXTRACTORS, Screw

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Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Union Twist Drill Co., Athol, Mass.

FACING MACHINES

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.

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Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
General Electric Co., Schenectady 5, N. Y.

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Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

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FILES, Hack

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FILES, Hand

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DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Heller Bros. Co., Newcomerstown, Ohio.
Nicholson File Co., 23 Acorn St., Providence, R. I.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

FILES, Machine

Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

FILES AND BURS, Rotary

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Jarvis, Chas. L., Co., Middletown, Conn.
Peck, Stow & Wilcox Co, Southington, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

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Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jarvis, Chas. L., Co., Middletown, Conn.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

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American Air Filter Co., Inc., Louisville, Ky.

FILTERS, Coolant and Oil

Bowser, Inc., 1365 E. Creighton Ave., Fort Wayne, Ind.
Cuno Engrg. Corp., Meriden, Conn.

(Continued on page 348)

Shell mold and bronze casting
by Walworth Co., New York 17, N. Y.

SHELL MOLDING

And Mass Production

If your plant is set up for long run production, be sure to ask your foundryman about the shell molding process before you design ferrous or non-ferrous metal parts. Here are some of the advantages you may gain from this improved foundry technique:

- **Metal castings have almost pattern-smooth surfaces.**
- **Pieces are cast to closer finished dimensions—tolerances as close as .003 to .005 inches per inch.**
- **Higher percentage of sound, uniform castings cuts down on rejects.**
- **Metal castings require less machining, reducing production costs.**

The outstanding feature of shell molding is its use of thin-shell, lightweight sand molds bonded with BAKELITE Phenolic Resins. It may pay you to learn more about this process. Consult your foundryman. Or, if you have a foundry department, write Dept. OM-19 for booklet C-8, which describes shell molding and the BAKELITE Phenolic Resins developed expressly for it.

BAKELITE
TRADE-MARK
PHENOLIC RESINS FOR SHELL MOLDING

TRADE MARK

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A Division of
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See Couplings, Flexible.

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Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

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Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

FORGINGS, Drop
Bethlehem Steel Co., Bethlehem, Pa.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

FORGINGS, Hollow Bored
Bethlehem Steel Co., Bethlehem, Pa.
National Forge & Ordnance Co., Irvine, Warren County, Pa.

FORGINGS, Iron and Steel
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Morgan Engrg. Co., Alliance, Ohio.
National Forge & Ordnance Co., Irvine, Warren County, Pa.

FORGINGS, Upset
Bethlehem Steel Co., Bethlehem, Pa.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

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Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Columbia Machinery & Engineering Corp., Hamilton 1, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif. (Stretch-Wrap).
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Peck, Stow & Wilcox Co, Southington, Conn.
Yoder Co., 5500 Walworth, Cleveland, Ohio.

FORMING AND STAMPING MACHINES
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

FORMING TOOLS or Tool Blanks
Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Brown & Sharpe Mfg. Co., Providence, R. I.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

FRAMES, Machinery Welded
Mahon, R. H., Co., Detroit 34, Mich.

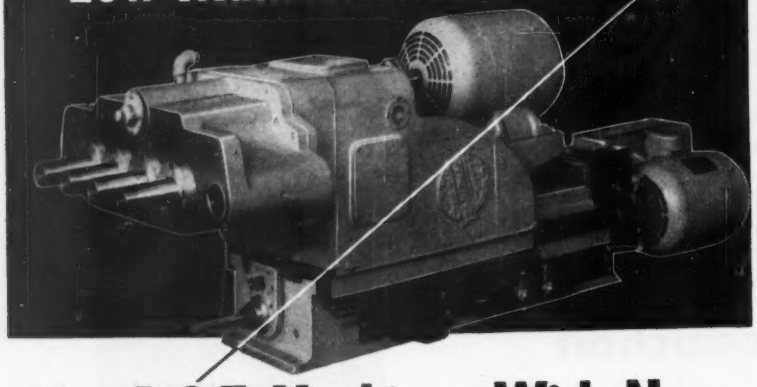
FURNACES, Heat-Treating
General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

FURNITURE, Shop
Standard Pressed Steel Co, Jenkintown, Pa.

GAGE BLOCKS
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St, New York 12, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Watham St., Watertown, Boston, Mass.

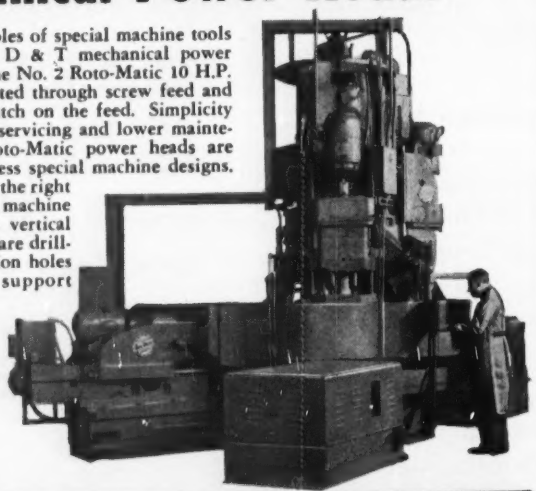
(Continued on page 350)

For High Production and Low Maintenance Costs *



Use D&T Machines With New Mechanical Power Heads

Here are two good examples of special machine tools designed and built with D & T mechanical power heads. Shown above, is the No. 2 Roto-Matic 10 H.P. head. All sizes are operated through screw feed and have overload release clutch on the feed. Simplicity of design makes for less servicing and lower maintenance costs. D & T Roto-Matic power heads are readily adapted to countless special machine designs. For instance: Machine to the right is a 6 station indexing machine with 3 horizontal and 3 vertical power heads. Operations are drilling and reaming suspension holes and king pin holes in support arms for power heads.



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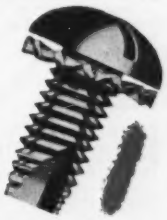
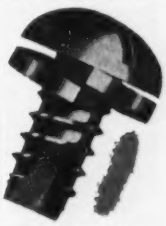


Type 23 for Die-Castings



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Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GAGES, Comparator

Ames, B. C., Co., Waltham 54, Mass.
Comtor Co., 47 Farwell St., Waltham 54, Mass.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Depth

Ames, B. C., Co. (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Homestrand, Inc., Larchmont, N. Y.
Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

GAGES, Dial

Ames, B. C., Co., Waltham 54, Mass.
Bristol Co., Platts Mills, Waterbury, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Homestrand, Inc., Larchmont, N. Y.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

GAGES, Electric

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GAGES, Height

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Homestrand, Inc., Larchmont, N. Y.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.

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Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

GAGES, Surface

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.

GAGES, Taper

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

GAGES, Thread

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Detroit Tap & Tool Co., Detroit, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

GASKETS

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Garlock Packing Co., Palmyra, N. Y.

GEAR BLANKS, Non-Metallic

Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

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Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GEAR CHAMFERING, ROUNDING AND BURRING MACHINES

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Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GEAR CHECKING INSTRUMENTS AND EQUIPMENT

Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7173 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

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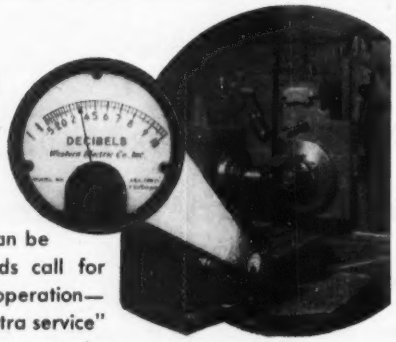
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.

(Continued on page 352)

there's a *db in gears



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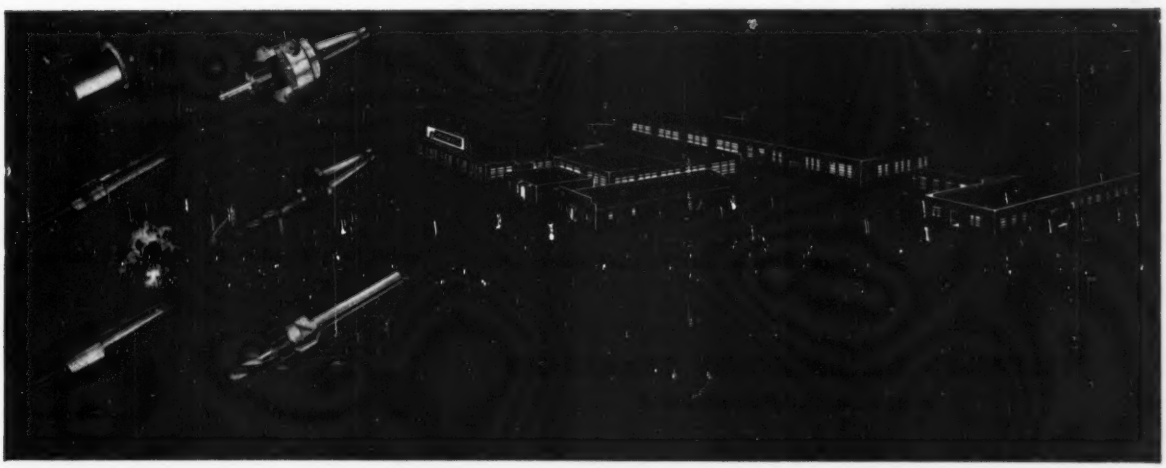

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Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

GEAR CUTTING MACHINES, Spur and Helical Gears (Shaper or Planer Type)

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Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Kelvin Systems Corp., 135 Front St., New York 5, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.

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Fellows Gear Shaper Co., 78 River St., Springfield, Vt. (Straight and Hourglass Types).
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Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.

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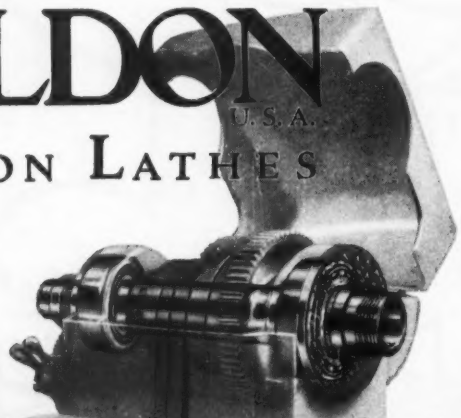

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Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.

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Gleason Works, 1000 University Ave., Rochester 3, N. Y.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

GEAR HARDENING MACHINES

Gleason Works, 1000 University Ave., Rochester 3, N. Y.

GEAR LAPPING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

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GEAR SHAVING MACHINES

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Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

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Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEARS, Cut

American Stock Gear Div., Perfection Gear Co., Harvey, Ill.
Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Automotive Gear Works, Inc., Richmond, Ind.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Brad Foote Gear Works, 1309 S. Cicero Ave., Cicero 50, Ill.
Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gears Div., Michigan Tool Co., 7200 E. McNichols Rd., Detroit, Mich.
Diefendorf Gear Corp., 920 N. Beldon Ave., Syracuse, N. Y.

(Continued on page 354)

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Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Illinois Gear & Mch. Co., 2120 No. Natchez Ave., Chicago 35, Ill.
Mass. Gear & Tool Co., 36 Nassau St., Woburn, Mass.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Perkins Mch. & Gear Co., Box 1611, Springfield 2, Mass.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GEARS, Rawhide and Non-Metallic

American Stock Gear Div., Perfection Gear Co., Harvey, Ill.
Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
Diefendorf Gear Corp., 920 N. Beldon Ave., Syracuse, N. Y.
Earle Gear & Mch. Co., 4707 Stenton Ave., Wayne Junction, Philadelphia 44, Pa.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

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Lincoln Electric Co. (Arc), 22801 St. Clair Ave., Cleveland, Ohio.
Reliance Elec. & Engrg. Co., Collinwood Sta., 1088 Ivanhoe Rd., Cleveland, Ohio.
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Sinclair Refining Co., 630 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

GRINDERS, Carbide Tool

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDERS, Die and Mold

Consolidated Mch. Tool Corp., Rochester, N. Y.
Dumore Co., 1300 17th St., Racine, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDERS, Oilstone, for Woodworking Tools

Mummert-Dixon Co., Hanover, Pa.

GRINDERS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co. 5125 Clinton Ave., Houston 20, Texas.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.
Madison-Kipp Corp., Madison, Wis.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

GRINDERS, Portable Electric and Toolpost

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Dumore Co., 1300 17th St., Racine, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Millers Falls Co., Greenfield, Mass.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

(Continued on page 356)

Cleaner, Sharper Threads *Faster!...*

with PROCUNIER Tapping Heads

Procunier Tapping attachments have established a reputation for outstanding performance in the tapping industry. They have helped increase output capacity, and have reduced maintenance, operating and spoilage costs to a minimum. Developed by practical craftsmen — who have concentrated exclusively on developing, improving and perfecting tappers for more than 30 years— Procunier tappers offer the rare combination of high speed, dependable accuracy, lasting endurance and economy of operation. Special exclusive construction features enable them to cut threads **faster, for longer periods**— with fewer spoiled pieces, fewer rejects. Here's why:

1. **Tap breakage is practically eliminated** due to the high sensitivity of the new Procunier cork-faced friction clutch which automatically regulates driving pressure. Thus, even "green" operators can quickly detect dull or loaded taps by the "feel" or pressure on the clutch.
2. **Strain and wear are minimized** and tortion eliminated thru special gear reversing mechanism which distributes pull thru three intermediate gears.
3. Chuck spindle is supported at both ends assuring true operation—**avoiding tap wobble.**
4. **Aluminum housings** assure greater strength and rigidity with minimum weight—a vital factor for high speed tapping.
5. PLUS many other exclusive features.

The exclusive Procunier "Tru-Grip" tap holder is lighter, smaller in diameter. It affords easier tapping close to walls or shoulders, eliminates "chewed" tap shanks. Holds tap true.

Write Today for more complete details and specifications on the complete line of Procunier Tapping Heads and see why Procunier offers the "finest in tapping equipment."

PROCUNIER SAFETY CHUCK CO.
16 S. Clinton St., Chicago 6, Ill. Dept. 2

Gentlemen: Please send your illustrated brochure giving complete details, specifications and prices on the improved line of Procunier High Speed Tapping Heads.

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Address.....
City.....Zone.....State.....

Procunier
Safety Chuck Company
116 S. CLINTON ST. CHICAGO 6, ILL.

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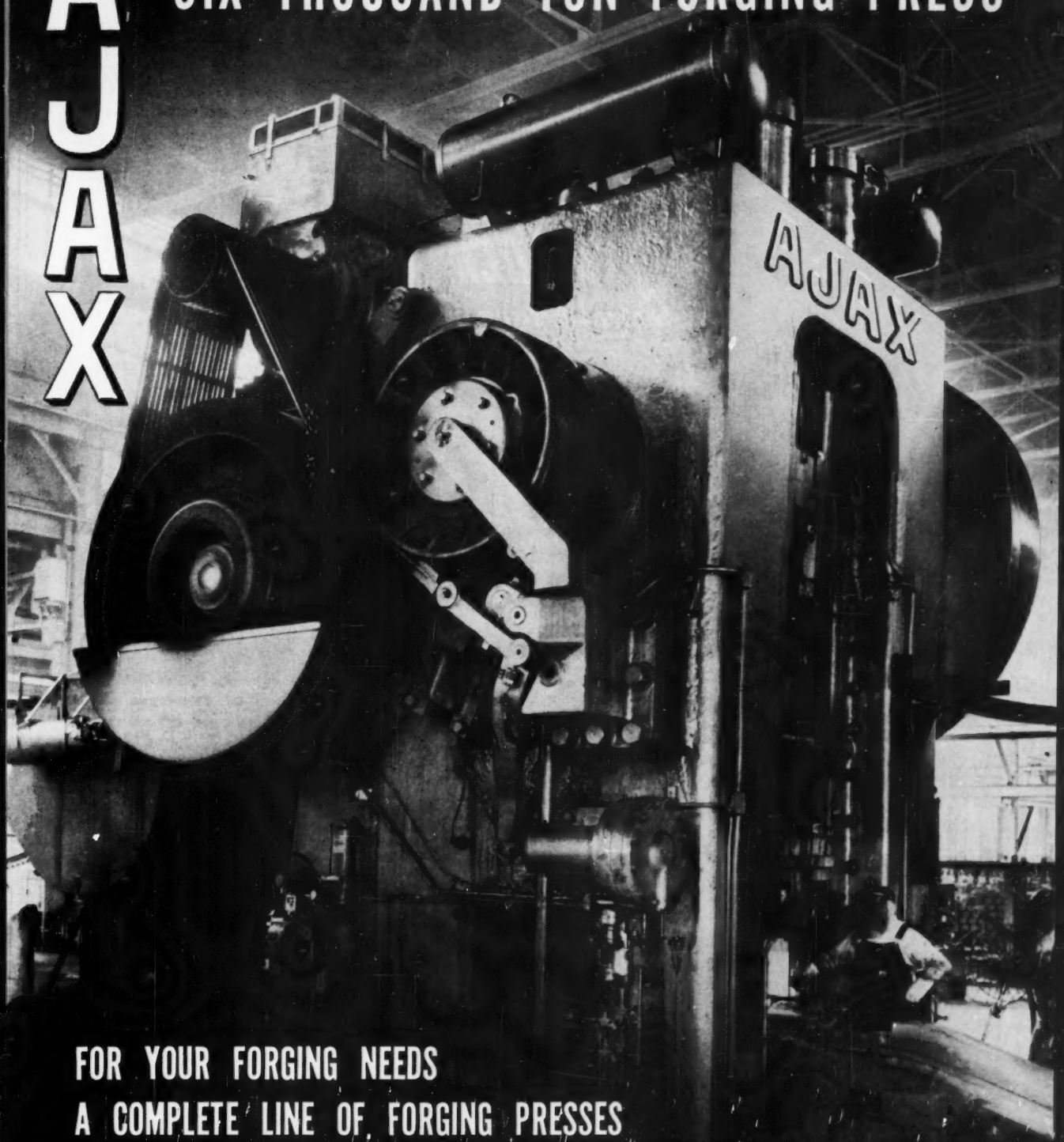

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A COMPLETE LINE OF FORGING PRESSES
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MANUFACTURED BY THE **AJAX** MANUFACTURING COMPANY

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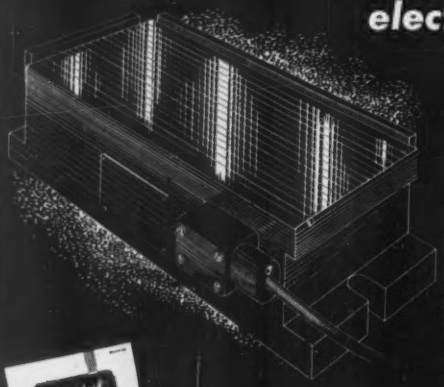
FOR THOSE SMALL JOBS...

it's Magna-Lock electro-magnetic CHUCKS



5" x 10"... 6" x 12"... 6" x 18" working surfaces. Ideal for bench work, small machine tools. 22% more holding power . . . moisture proof . . . other advantages of larger Magna-Lock Chucks. Complete with rectifier and switch for operation on A.C. voltage.

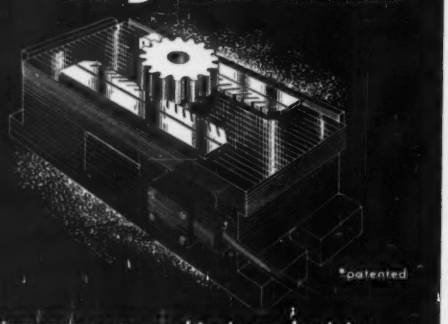
Price: 5 x 10 ..... $125.00
6 x 12 ..... 139.00
6 x 18 ..... 225.00

IMMEDIATE DELIVERY

Get details... WRITE DEPT. M-23

...AND FOR NON-MAGNETIC MATERIALS | it's Magna-Vise*

HOLDS fibre, brass, copper, plastic, others. Increases versatility of your magnetic chucks. Send for facts.



*patented

Magna-Lock is first to increase your machine's productivity

Hanchett MAGNA-LOCK CORPORATION
Magnetic Chucks and Devices
BIG RAPIDS, MICHIGAN, U. S. A.

GRINDING FIXTURES

Geometric Tool Co. (Die Chaser), Westville Station, New Haven 15, Conn.
Madison Mfg. Co., Muskegon Heights, Mich.

GRINDING MACHINES, Abrasive Belt

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Mch. Works, Rockford, Ill.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Porter-Cable Mch. Co., Salina St., Syracuse, New York.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

GRINDING MACHINES, Bench

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Millers Falls Co., Greenfield, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

GRINDING MACHINES, Broach

Colonial Broach Co., Detroit 13, Mich.
Lapointe Mch. Tool Co., 34 Tower St., Hudson, Mass.

GRINDING MACHINES, Camshaft

Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Carbide Tool

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

GRINDING MACHINES, Centerless

Cincinnati Grinders, Inc., Cincinnati, Ohio.
Diversified Metal Products Co., 5125 Alcoa Ave., Los Angeles 58, Calif.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Landis Tool Co., Inc., Waynesboro, Pa.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

GRINDING MACHINES, Chucking

Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Landis Tool Co., Inc., Waynesboro, Pa.

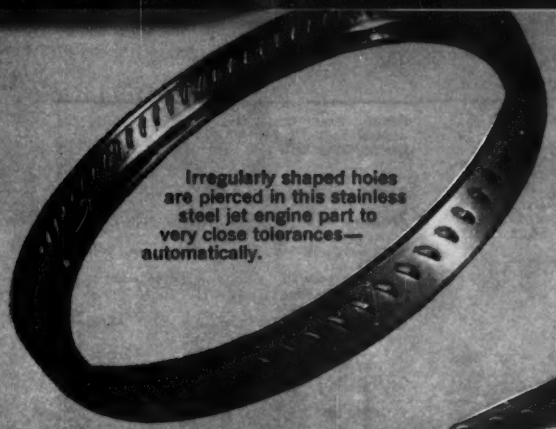
GRINDING MACHINES, Crankshaft

Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

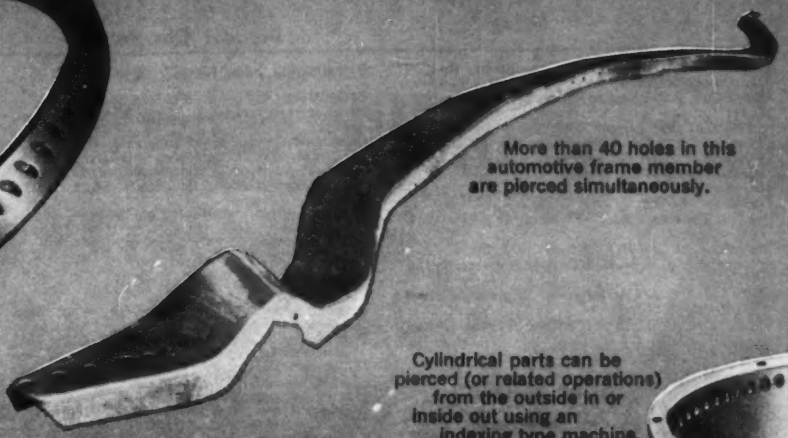
GRINDING MACHINES, Cylindrical

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.

(Continued on page 358)

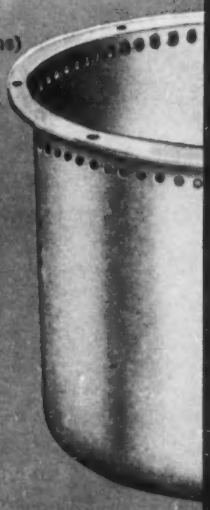


Irregularly shaped holes are pierced in this stainless steel jet engine part to very close tolerances—automatically.



More than 40 holes in this automotive frame member are pierced simultaneously.

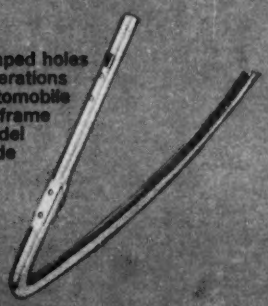
Cylindrical parts can be pierced (or related operations) from the outside in or inside out using an indexing type machine.



High Production Piercing...

IN A SINGLE SET-UP

Seven irregular shaped holes and two trimming operations complete this automobile door inner window frame in one setup. Model changes can be made at little expense.



Based on a recent development in piercing technique, you can pierce more holes simultaneously—faster and with greater accuracy—on Danly Metalworking Equipment. Eliminate awkward multiple handling . . . pierce all holes faster in a simple, single set-up.

Built specifically for your piece part, these are only a few of the advantages of Danly Hydraulic Metalworking Equipment:

Consider these important features!

- *HIGH CAPACITY*—Up to 225 tons available per cylinder.
- *BREAKTHROUGH SHOCK PRACTICALLY ELIMINATED*—Permits greater capacity without hydraulic circuit or tool trouble . . . smoother, faster.
- *AUTOMATIC STRIPPING*—An integral feature of every cylinder . . . each station hydraulically strips its punch. This unique action simplifies fixturing, is practically foolproof.
- *ACCURACY, FLEXIBILITY*—Pierces practically any type of hole . . . round, oblong or irregular to very close tolerances.

DANLY®

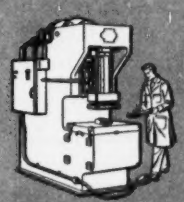
DANLY MACHINE SPECIALTIES, INC.

2100 South Laramie Avenue • Chicago 50, Illinois

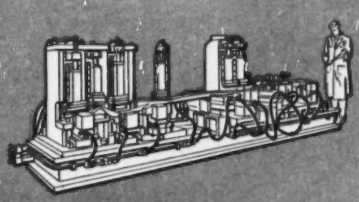
HYDRAULIC METALWORKING EQUIPMENT

MECHANICAL PRESSES 50 TO 3000 TONS

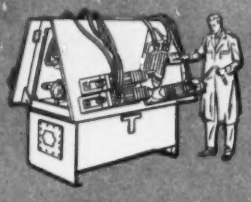
DANLY HYDRAULIC METALWORKING EQUIPMENT



General Purpose Gap Frame Piercing Press



Automotive Frame Piercing Machine



Automotive Inner Window Frame Piercing Machine

Jet Engine Shroud Ring Piercing Machine

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Inc., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Dumore Co., 1300 17th St., Racine, Wis.
Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kelvin Systems Corp., 135 Front St., New York 5, N. Y.
Landis Tool Co., Inc., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Rivett Lathe & Grinder, Inc. Brighton, Boston 35, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GRINDING MACHINES, Die Chaser

Eastern Mch. Screw Corp., New Haven, Conn.
Landis Machine Co., Waynesboro, Pa.

GRINDING MACHINES, Disc

Besly-Welles Corp., Beloit, Wis.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Mattison Machine Works, Rockford, Ill.
Porter-Cable Machine Co., Salina St., Syracuse, N. Y.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDING MACHINES, Drill

Blake, Edward, Co., 442 Cherry St., West Newton 65, Mass.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gallmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

For machine screws, wood screws, drive screws, specials, etc. These machines have automatic feed and self-lubrication. They feature accuracy, easy setup, rigidity and table-top working level. Model A-312 rolls screws from .138 through ⅜" diameter with thread lengths up to 2½". Smaller model A-190 rolls from .086 through .190 inches diameter with thread length up to 1½".

When it comes to production —

THE HARTFORD SPECIAL MACHINERY CO., HARTFORD 12, CONN.

Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, Face

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Mattison Machine Works, Rockford, Ill.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

GRINDING MACHINES, Flexible Shaft

See Flexible Shaft Equipment.

GRINDING MACHINES, Gap

Cincinnati Grinders, Inc., Cincinnati, Ohio.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Gear Tooth

See Gear Grinding Machines.

GRINDING MACHINES, For Sharpening Cutters, Reamers, Hobs, Etc.

Barber-Colman Co., Rock and Montague, Rockford, Ill.
British Industries Corp., 164 Duane St., New York, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gallmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Landis Tool Co., Waynesboro, Pa.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio.
Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, For Sharpening Turning and Planing Tools

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Walker, O. S., Co., Inc., Worcester, Mass
Waltham Machine Works, Newton St., Waltham, Mass.

GRINDING MACHINES, Internal

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Dumore Co., 1300 17th St., Racine, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.

(Continued on page 362)

Heller NUCUT files

do two jobs at every stroke!

Two distinct sets of teeth make possible double-action filing at every stroke. The coarse teeth cut clean, deep, true without scraping or skidding. On the same stroke, the fine teeth leave the work surface sleek and smooth. Order through your local distributor.

Adaptable

1 NATCO TWO-WAY DRILLER made up of two HOLEUNITS

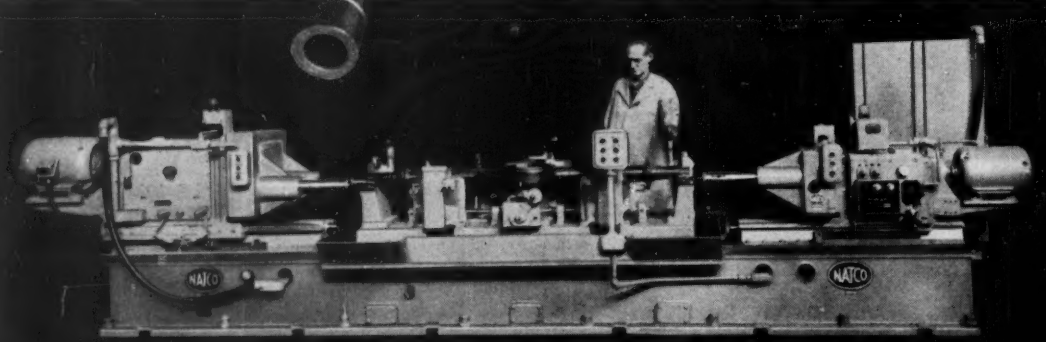
R. H. HEAD Drill one hole for tapered hole (approximately 1/32" smaller than small end of taper)

L. H. HEAD Drill one hole for tapered hole (approximately 1/32" smaller than small end of taper)

L. H. HEAD Drill one hole with multi-diameter tool to remove as much stock for taper as possible.

PART: Axle Housing

PRODUCTION: 30 parts per hour



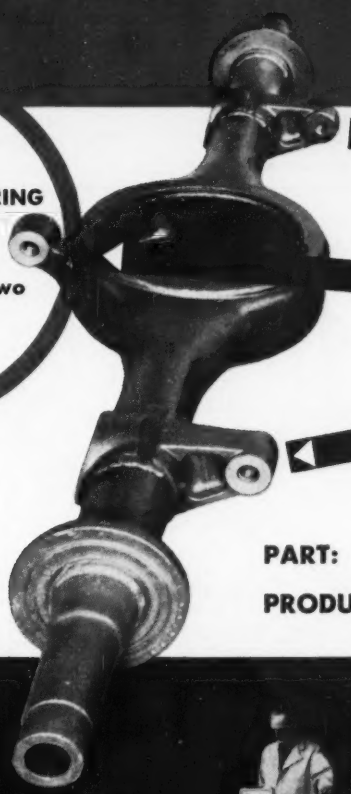
NATCO ENGINEERED for Quality and Quantity Production

NATCO HOLEUNITS ARE FLEXIBLE AND INTERCHANGEABLE . . . They provide standard, compact, self contained hydraulic units which can be arranged in groups to drill, bore, ream, counterbore, hollow-mill, chamfer, face or tap in various sides of a part with a minimum of handling. NATCO HOLEUNITS will operate horizontally or at any angle to form a way type or station type machine. Should the part or parts be altered NATCO HOLEUNITS may be re-arranged with new spindle boxes. Thus you get highly specialized machines with standardized NATCO HOLEUNITS for highest production at low cost. Let a NATCO Field Engineer solve your "hole" problem.

NATCO HOLEUNITS

TEAMED-UP FOR ECONOMICAL PRODUCTION

2 **NATCO TWO-WAY BORING AND FACING MACHINE made up of two HOLEUNITS**



L. H. HEAD Combination counterbore and face boss on one hole 1⅛" diameter counterbore

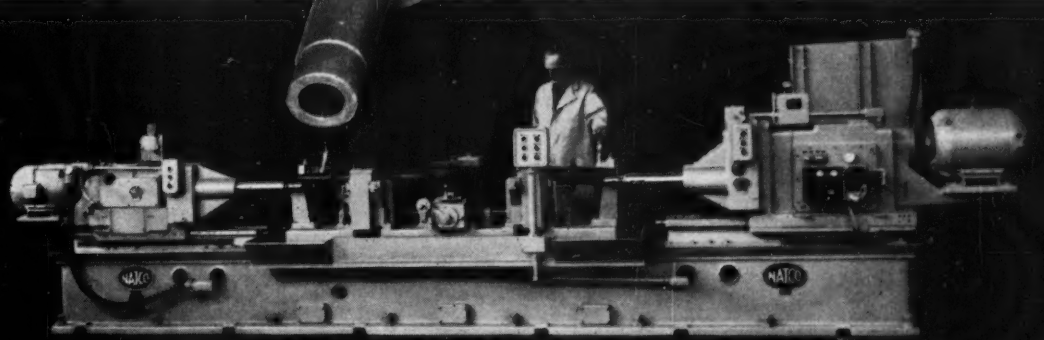
R. H. HEAD

Combination counterbore and face boss on two holes 1⅛" diameter counterbore.

R. H. HEAD

PART: Same axle housing after first NATCO machine completes drilling.

PRODUCTION: 45 parts per hour



Call a Natco Field Engineer

to help you solve your problems in Drilling, Boring, Facing and Tapping.

NATCO

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

Branch Offices

1809 Engineering Bldg., CHICAGO • 409 New Center Bldg., DETROIT
1807 Elmwood Ave., BUFFALO • 2902 Commerce Bldg., NEW YORK CITY

Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.

GRINDING MACHINES, Jig

Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Pratt & Whitney, West Hartford 1, Conn.

GRINDING MACHINES, Knife and Shear Blade

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Machine Works, Rockford, Ill.

GRINDING MACHINES, Piston Ring

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

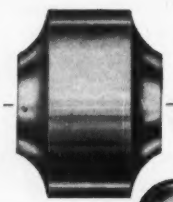
GRINDING MACHINES, Profile

Cleveland Grinding Machine Co., 1643 Eddy Rd., Cleveland 12, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GRINDING MACHINES, Radial, Ball Race, Etc.

Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Landis Tool Co., Waynesboro, Pa.

Making parts like these?

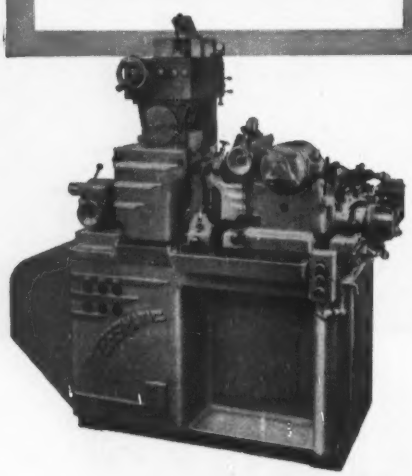


Both radii concentric with bore

Both ball ends concentric with shaft axis

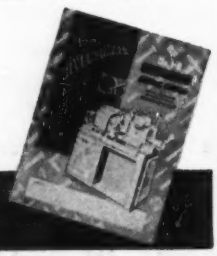
You can Centerless Grind all Surfaces Simultaneously, Insure perfect Concentricity on a DIVERSIMATIC

Having concentricity problems on precision formed parts? Need better finish? DIVERSIMATIC with the new CRUSH FORMING attachment gives you the answer.



CRUSH FORMING profiles the wheel to exact contours; imparts these shapes to rough-turned parts, grinding all surfaces simultaneously. Where formed parts require only a nominal amount of metal removed, *they can frequently be ground from the solid!*

CRUSH FORMING on centerless grinding is exclusive with DIVERSIMATIC. It's possible only because of Diversimatic's unusual, deflection-free, anti-friction spindle . . . *The spindle that needs no warm-up!*



Get full DIVERSIMATIC FACTS today.

DIVERSIFIED METAL PRODUCTS CO.
2838 Leonis Avenue, Los Angeles 58, California

GRINDING MACHINES, Radius, Link

Consolidated Mch. Tool Corp., Rochester, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

GRINDING MACHINES, Ring Wheel

Besly-Welles Corp., Beloit, Wis.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDING MACHINES, Roll

Farrel-Birmingham Co., 25 Main St., Ansonia, Conn.
Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Spline Shaft

Kelvin Systems Corp., 135 Front St., New York 5, N. Y.

GRINDING MACHINES, Surface

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Blanchard Machine Co., 64 State St., Cambridge, Mass.
British Industries Corp., International Machinery Div., 164 Duane St., New York, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Gallmeyer & Livingston Co., 336 Straight Ave., S.W., Grand Rapids 4, Mich.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Machine Works, Rockford, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reid Bros. Co., Inc., Beverly, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio
Walker, O. S., Co., Inc., Worcester, Mass.

GRINDING MACHINES, Tap

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.

GRINDING MACHINES, Thread

Dumore Co., 1300 17th St., Racine, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Landis Machine Co. (Centerless), Waynesboro, Pa.
Landis Tool Co. (Centerless), Waynesboro, Pa.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

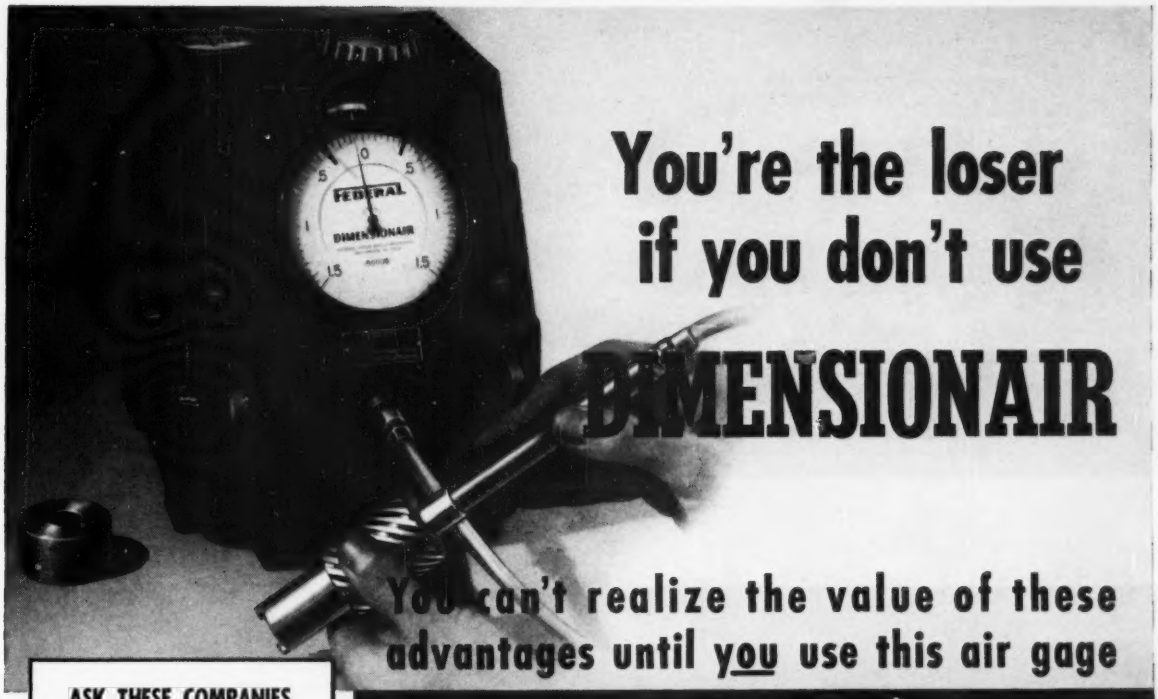
GRINDING MACHINES, Universal

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Inc., Cincinnati, Ohio.
Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kelvin Systems Corp., 135 Front St., New York 5, N. Y.
Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

GRINDING MACHINES, Worm

Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Pratt & Whitney, West Hartford 1, Conn.

(Continued on page 366)



You're the loser if you don't use DIMENSIONAIR

You can't realize the value of these advantages until you use this air gage

ASK THESE COMPANIES HOW THEY LIKE THE DIMENSIONAIR

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Ford Motor
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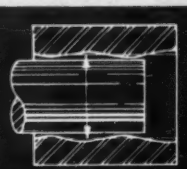
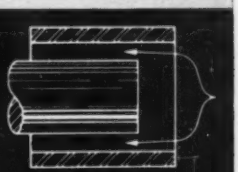
PRECISELY CALIBRATED DIAL
Each division on entire dial is actually 50 millionths. Not arbitrarily divided between limits like old-style GO, NO-GO Air Gages.

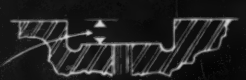


LONGER APPROACH RANGE
Approximately .002" • Plug fitted better to suit tolerances • More leeway before reaching finished size • Use same plug on rough and finished dimensions.

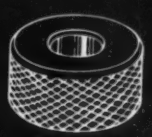


GREATER CLEARANCE
.0018" up to .0038" • Easier to insert plug and check taper, out-of-round, etc. • Plug doesn't stick in irregular-shaped holes.

STEADY, STABLE POINTER
Doesn't fluctuate with air line pressure variations • No pointer flutter.



LONGER PLUG WEAR
Jet faces are deeper — a feature which really saves plug costs.



ONE MASTER
This is the only air gage built with enough precision to permit use of only one master.

The FEDERAL Dimensionair *is* an exceptional air gage with *many outstanding* advantages. We ask you to try the Dimensionair yourself and to compare it with any other air gage. Write today for complete information and prices. Federal Products Corporation, Providence 1, R. I.

Try it — and be convinced!

FEDERAL

Largest manufacturer devoted exclusively to designing and manufacturing all types of DIMENSIONAL INDICATING GAGES

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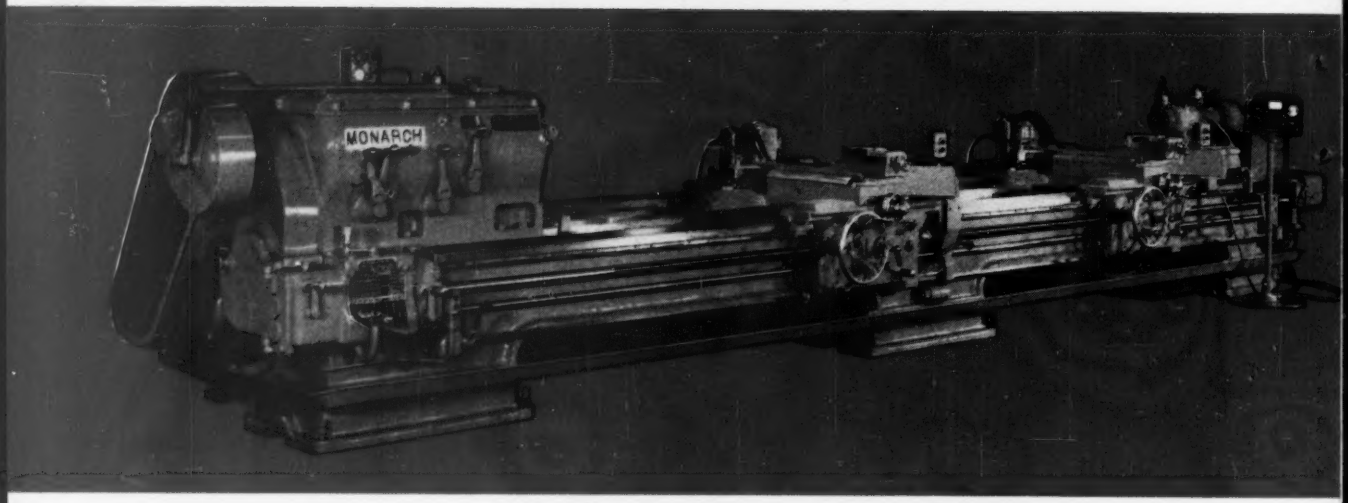
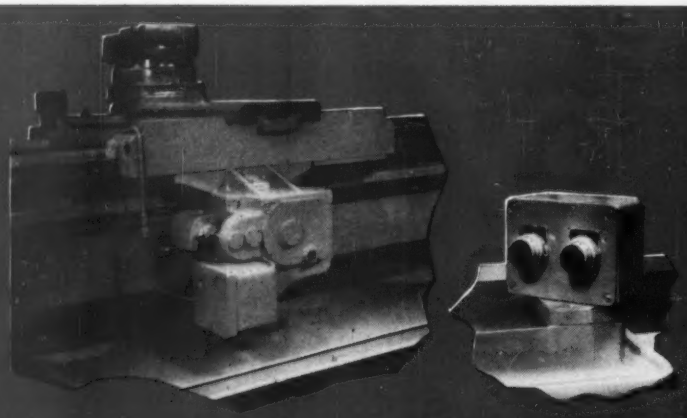
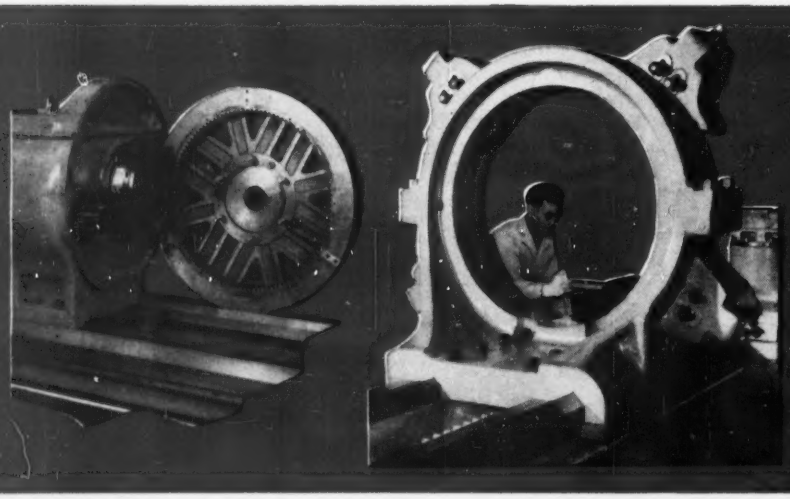




PLUS CONTROL. A smoothly functioning rapid traverse in either direction is furnished by unit mounted at rear of machine (left). Push button controls on front carriage wing (right) give instant response only when depressed. Standard on 25" Model N and 32" Model NN, optional on 20" Model M.

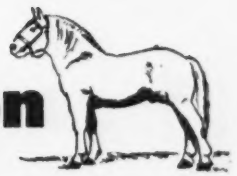


PLUS POWER. For heavy stock removal from large diameter work, the optional face plate drive headstock is a "must" (left). It insures full, even delivery of power under load. Drive may also be taken through spindle. Steady rests of great capacity and strength are provided. This one (right) will take work 36" to 38½" diameter.

Monarch 25" Model N with long bed. Note optional dual carriages—ideal for peak production on long shafts and gun barrels. Perfect performance is noted with two tools turning simultaneously. Air-Gage Tracer Controls can be supplied for both carriages (as shown), either carriage, or neither. Monarch-Keller controls can also be furnished.

BIG Monarchs

Powered like a Percheron



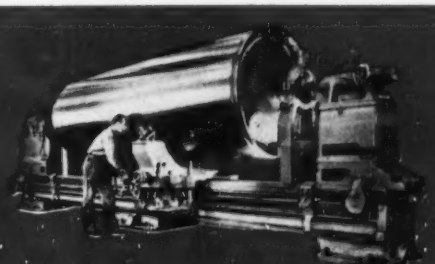
Nimble as a Pony

Imagine a great steel-muscled Percheron with the instant, spirited responsiveness of a polo pony—and you've got a picture of the Monarch Heavy Duty Lathes. Here are lathes with the size, power and rigidity to hog off heavy cuts from big work—yet built to provide high finish, close accuracy and convenience of operation! Witness the great number of them—both with and without Air-Gage Tracer controls—speeding production of critical jet aircraft parts today.

Here's unequaled strength and versatility within the capacities offered—20", 25" and 32" swings in standard lengths up to 324" between centers. Look at the special features and applications we've found room to illustrate here. Then write for our Booklet #1208—36 pages of data and pictures—for the complete Monarch Heavy Duty Lathe story. We'll send it gladly . . . . *The Monarch Machine Tool Company, Sidney, Ohio.*

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

Monarch
ACCURACY • ECONOMY • LONG LIFE
TURNING MACHINES



PLUS SWING. For maintenance and repair work—for occasional big parts, light cuts on big diameters, and turning shafts with previously machined large sections, plus swing up to 60" and more can be provided. This Model SN, shown turning a paper machine drum, swings 84"

GRINDING WHEELS

Bakelite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Bay State Abrasive Products Co., Westboro, Mass.
Besly-Welles Corp., Beloit, Wis.
Blanchard Machine Co., 64 State St., Cambridge, Mass.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Cincinnati Milling Machine Co., Grinding Wheels Div., Cincinnati, Ohio.
Gardner Machine Co. (Surface Grinder), 414 E. Gardner St., Beloit, Wis.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Precision Diamond Tool Co., 102 South Grove Ave., Elgin, Ill. (Diamond).
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.

GROOVING TOOLS, Internal

Waldes Kohinoor, Inc., 4716 Austel Place, Long Island City 1, N. Y.

HAMMERS, Drop

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Columbia Machinery & Engineering Corp., Hamilton 1, Ohio.
Morgan Engrg. Co., Alliance, Ohio.

HAMMERS, Forging Air

Chambersburg Engrg. Co., Chambersburg, Pa.
Lobdell United Co., 2000 "G" St., Wilmington 99, Del.

HAMMERS, Pneumatic

Chambersburg Engrg. Co., Chambersburg, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co. 5125 Clinton Ave., Houston 20, Texas.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.

HAMMERS, Portable Electric

Black & Decker Mfg. Co., E. Penna Ave., Towson, Md.
Millers Falls Co., Greenfield, Mass.

HAMMERS, Power

Chambersburg Engrg. Co., Chambersburg, Pa.
Lobdell United Co., 2000 "G" St., Wilmington 99, Del.

HAMMERS, Shaft

S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.

HAMMERS, Soft

Chambersburg Engrg. Co., Chambersburg, Pa.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

HAMMERS, Steam

Chambersburg Engrg. Co., Chambersburg, Pa.

HARDENING EQUIPMENT

Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio.

HARDENING MACHINES, Flame

Cincinnati Milling Machine Co., Cincinnati, Ohio.

HARDNESS TESTING INSTRUMENTS

Ames Precision Mch. Wks., Waltham, Mass.
Shore Instrument & Mfg. Co., Van Wyck Ave. and Carll St., Jamaica, N. Y.
Wilson Mechanical Instrument Co., Inc., 230-D Park Ave., New York, N. Y.

HEADING MACHINES

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

HEAT-TREATING EQUIPMENT

Ipsen Industries, Inc., 536 No. Madison, Rockford, Ill.

HEAT-TREATMENT OF METALS

Bennett Metal Treating Co., Elmwood, Conn.

HOBBING MACHINES

See Gear Cutting Machines, Spur and Helical Gears (Hobbing), and Gear Cutting Machines, Worm and Worm Wheels.

HOBS

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Twist Drill & Tool Co., Rochester, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Union Twist Drill Co., Athol, Mass.

HOIST HOOKS

Bethlehem Steel Co., Bethlehem, Pa.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

HOISTING AND CONVEYING EQUIPMENT

Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

HOISTS, Air

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Ingersoll-Rand Co., Phillipsburg, N. J.

HOISTS, Chain, Etc.

Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

(Continued on page 370)

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(PORTAGE DOUBLE-QUICK)

Changes from one tool to another is a matter of seconds. Three point locking feature and tapered shank assures repositioning and eliminates "run out."
Send for catalog describing individual holders and adapters or for specific information on your machine tools.

PORTAGE Double-Quick TOOL CO.
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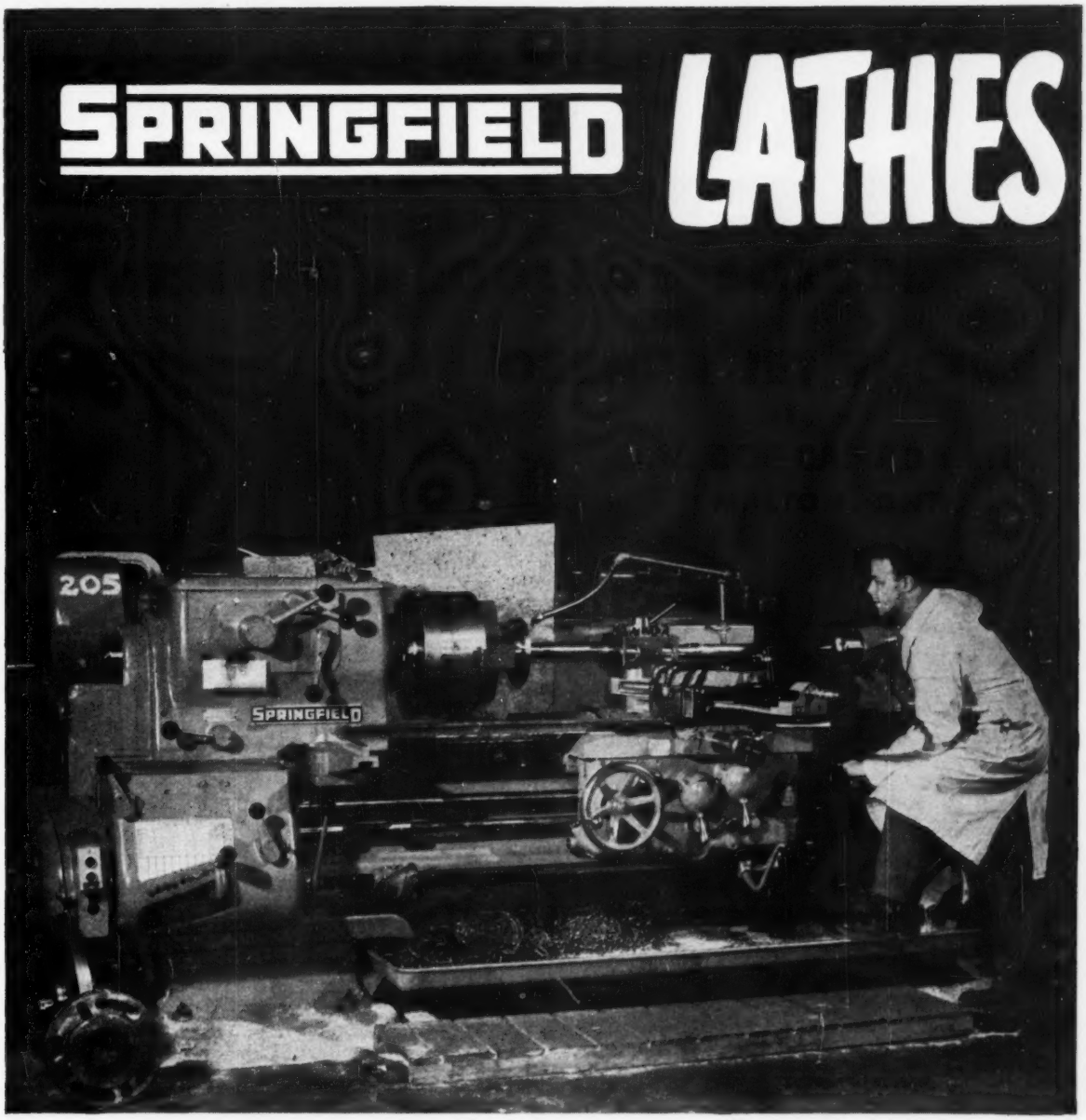
SPRINGFIELD LATHES



SPRINGFIELD CONTOURING LATHE BORING INTERNAL PROFILE ON STUB SHAFTS FOR ORENDA JET ENGINE

The precision and high productive capacity of Springfield Lathes makes them ideally suited for the rigid demands of Jet Engine production.

Years of experience adapting engine lathes to the production of all types of work has enabled us to build into Springfield Lathes the quality which assures top performance in operation.

Benefit by our long experience through the advanced design, sturdy reliability and production capacity of Springfield Lathes.

THE SPRINGFIELD MACHINE TOOL COMPANY

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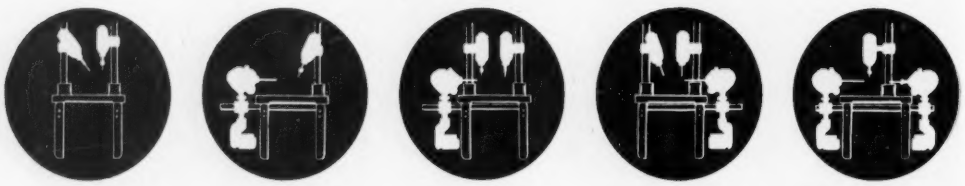
EXCLUSIVE REPRESENTATIVES IN ALL PRINCIPAL CITIES

MAGNA DRILL

the completely universal drilling machine

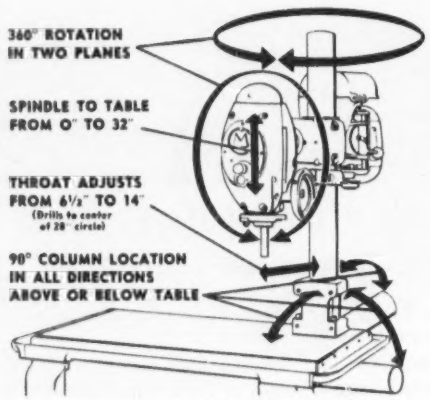


If you're still drilling holes one at a time, there are important new production economies waiting for you in MAGNA DRILL, the completely *universal* drilling machine. MAGNA DRILL increases speed and accuracy, cuts tool and labor costs . . . in both large and small shops, in both limited and mass production.

Key to these benefits lies in MAGNA DRILL'S complete versatility. Any number of heads can be set up quickly and accurately for simultaneous multiple drilling . . . each with its own speed, feed and drilling angle. MAGNA DRILL takes any attachment and performs any operation possible with a conventional drill . . . plus complete freedom of spindle location. The self-contained power feed can be actuated manually or by solenoid for simultaneous or sequential operation.

MAGNA DRILL can be changed quickly from one setup to another *without special tooling!*

MAGNA DRILL duplicates the economies of elaborate, custom-built, multi-spindle machines. Yet it is so adaptable that even short runs can be produced at amazingly low costs. Where tumble jigs are used, savings are even more impressive, since all holes can be drilled at the same time.


360° ROTATION IN TWO PLANES
SPINDLE TO TABLE FROM 0" TO 32"
THROAT ADJUSTS FROM 6½" TO 14" (Drills to center of 28" circle)
90° COLUMN LOCATION IN ALL DIRECTIONS ABOVE OR BELOW TABLE

As a single, gang, or multi-spindle unit, MAGNA DRILL is a rugged, *precision*, production tool. Enclosed drive adds to safety. Adjustable throat and angular freedom increase versatility.

SEE MAGNA DRILL DEMONSTRATED!

It can perform almost any drilling, tapping, reaming, counterboring, or similar operation! Just fill out and mail the coupon for complete literature.

SPECIFICATIONS

Capacity:	in steel	¾"
	in cast iron	1"
Stroke		5"
Throat (variable)		drills to center of 28" circle
Spindle speeds:	1800 rpm. motor	380 to 3430 rpm.
	3600 rpm. motor	760 to 6860 rpm.
Power feed rates		.003", .005", .008", .012" per rev.
Motor recommended		1 hp.

MAGNA ENGINEERING CORPORATION
Dept. 236-S at factory nearest you:
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☐ Please send me more information about MAGNA DRILL.

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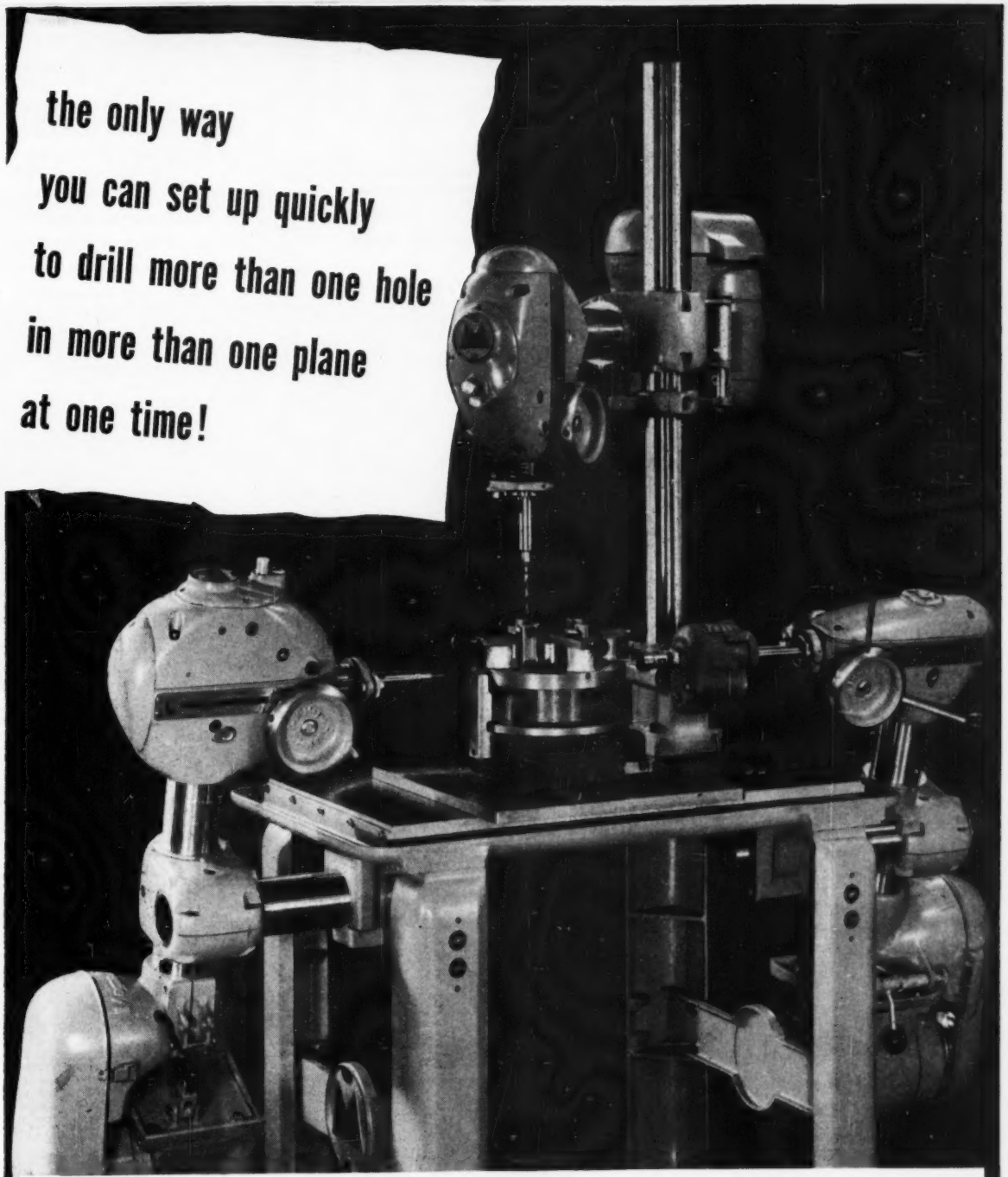
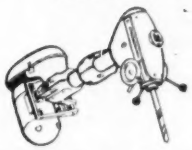
the only way you can set up quickly to drill more than one hole in more than one plane at one time!



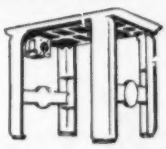
1001 QUICK SETUPS POSSIBLE WITH MAGNA DRILL MODULAR COMPONENTS



Drill Heads Standardized, adjustable heads can be indexed and locked at any angle or position *without special tools*. Variable throat. Right or left hand feed. **$265*.**

Columns and Bases ⅜" walls. 3½" precision-ground tubes support drill heads. Column bases are cast iron, line bored; can be mounted horizontally or vertically. **$45*.**

Power Feed (mechanical type) Attaches to any MAGNA DRILL head in a few minutes. Solenoid or manual engage; spring return. Can be set for automatic cycling. **$175*.**



Tables Drilled and tapped for mounting heads in variety of positions, and for ganging tables in multiples. Single table, 24" x 20", **$170*.** Double table, 24" x 40", **$220*.**

*DELIVERED TO YOUR PLANT

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Moline Tool Co., 102 20th St., Moline, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.

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Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.

HONING MACHINES, External

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.

HONING TOOLS AND FIXTURES

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.

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American Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y.
Cleco Div., Reed Roller Bit Co. 5125 Clinton Ave., Houston 20, Texas.
Titeflex, Inc., 500 Frelinghuysen Ave., Newark 5, N. J.

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American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.
Bethlehem Steel Corp., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Farquhar, A. B., Co., 21 Duke St., York, Pa.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
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South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
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DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Homestrand, Inc., Larchmont, N. Y.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

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Brown & Sharpe Mfg. Co., Providence, R. I.
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Brown & Sharpe Mfg. Co., Providence, R. I.
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Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

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Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio.

(Continued on page 372)

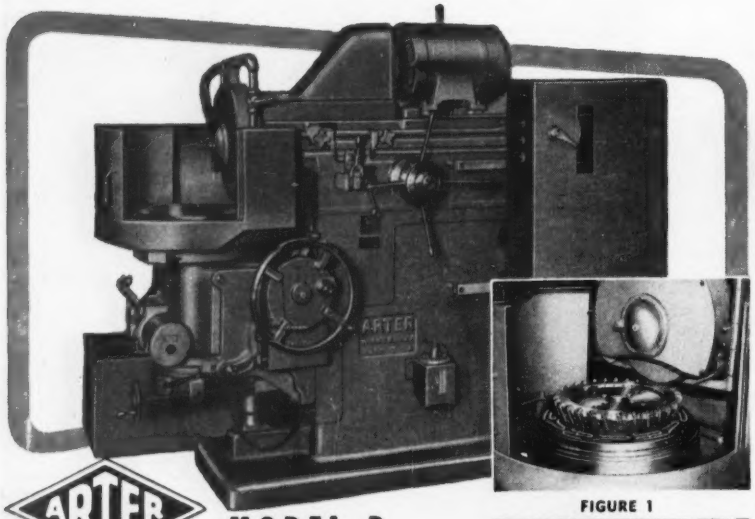

FIGURE 1

ARTER MODEL D

HYDRAULIC ROTARY SURFACE Grinder

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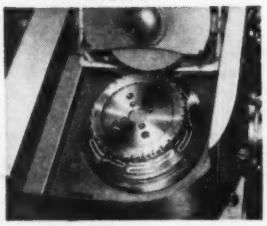

FIGURE 2

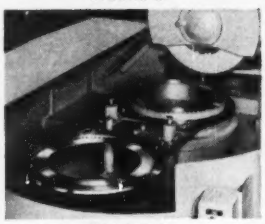

FIGURE 3

FIGURE 1—Inserted carbide tooth milling cutters ground on standard machine.

FIGURE 2—Machine built especially for grinding 45° angles on cutters.

FIGURE 3—Special Model D grinds by plunge cutting; work fed automatically up to non-oscillating grinding wheel.

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*U. S. PAT. PENDING

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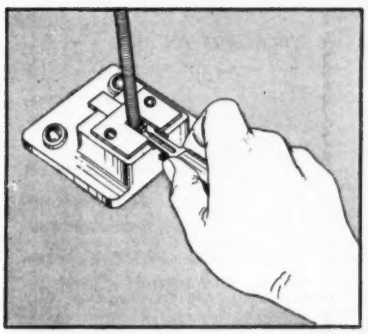
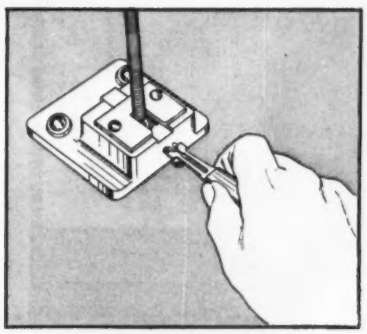
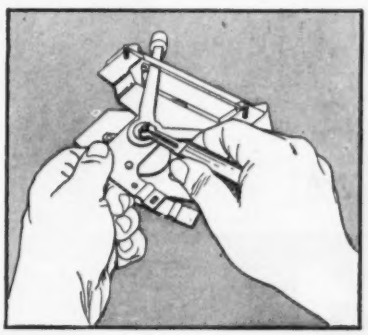


1 Truarc applicator is pushed forward and grips a single E-ring.



2 Applicator withdrawn (new ring automatically feeds into place).



3 Ring is installed in groove on shaft. No waste time or motion.

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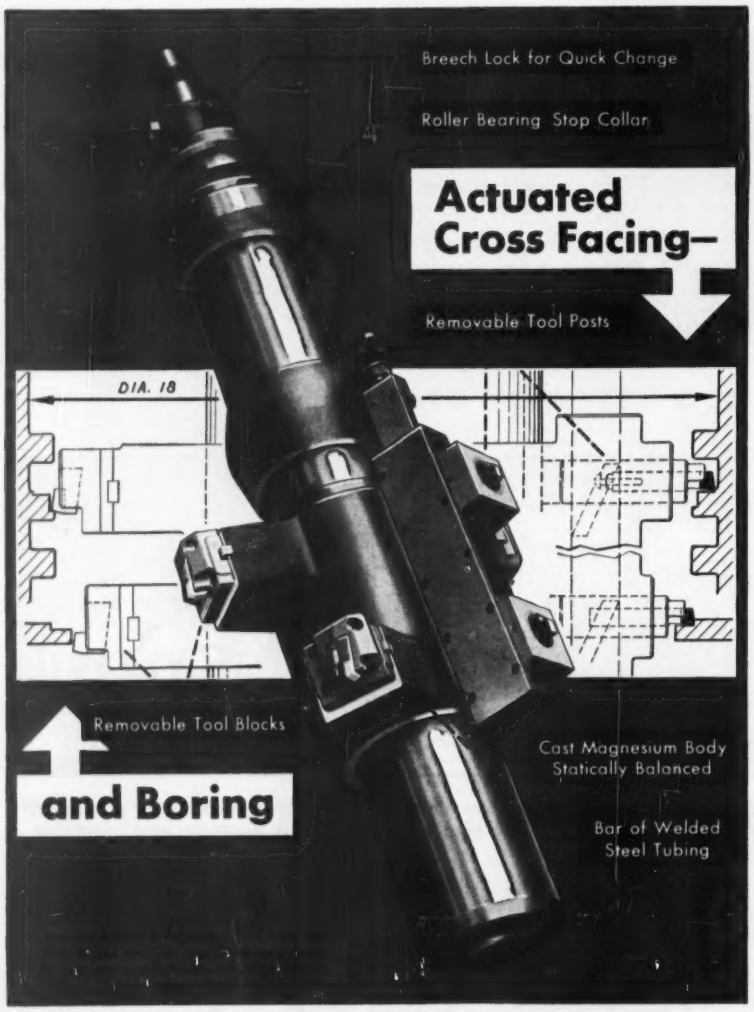

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(Continued on page 374)

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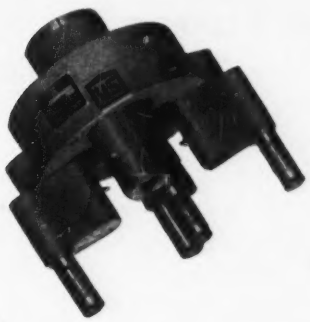

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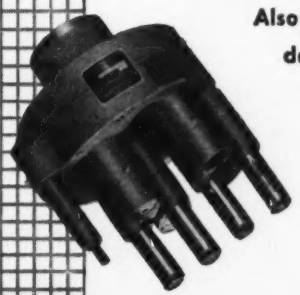

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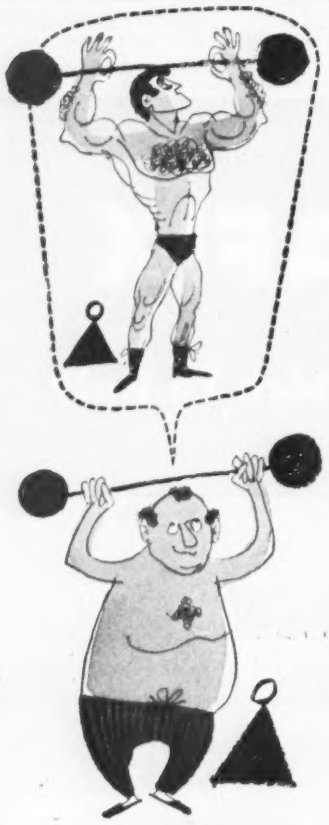

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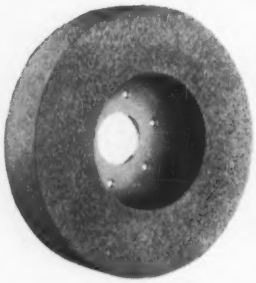

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Cosa Corp, 405 Lexington Ave., New York 17, N. Y.
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Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Morey Mchry. Co., Inc., 410 Broome St., New York, N. Y.
Murad Developments Ltd., Aylesbury, Bucks, England.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Potter & Johnston Co. (Automatic), 1027 Newport Ave., Pawtucket, R. I.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.
South Bend Lathe Works, 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHES, Vertical Turret

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Lehmann, J. M., Co., Inc., 55 New York Ave., Lyndhurst, N. J.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

LEVELS

Bullard Co., Brewster St., Bridgeport 2, Conn.
Millers Falls Co., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Starrett, The L. S., Co., Athol, Mass.

LOCKNUTS

Link-Belt Co. (For Positioning Bearings), 519 N. Holmes Ave., Indianapolis 6, Ind.

LUBRICANTS, Including Extreme Pressure (EP) Machinery Lubricants

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 129 Lockwood St., Newark 5, N. J.
Sinclair Refining Co., 630 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

LUBRICATING SYSTEMS

Bowser, Inc., 1365 E. Creighton Ave., Fort Wayne, Ind.
Farval Corp., 3249 E. 80th St., Cleveland, Ohio.
Madison-Kipp Corp., Madison, Wis.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

MACHINISTS' SMALL TOOLS

See Calipers, Hammers, Wrenches, Drills, Taps, Etc.

MANDRELS

See Arbors and Mandrels.

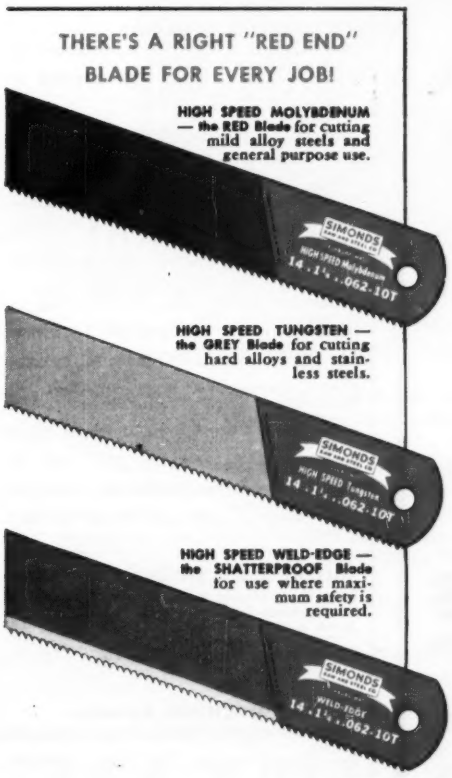
(Continued on page 378)

. . . you can count on it in every

SIMONDS

"Red End"

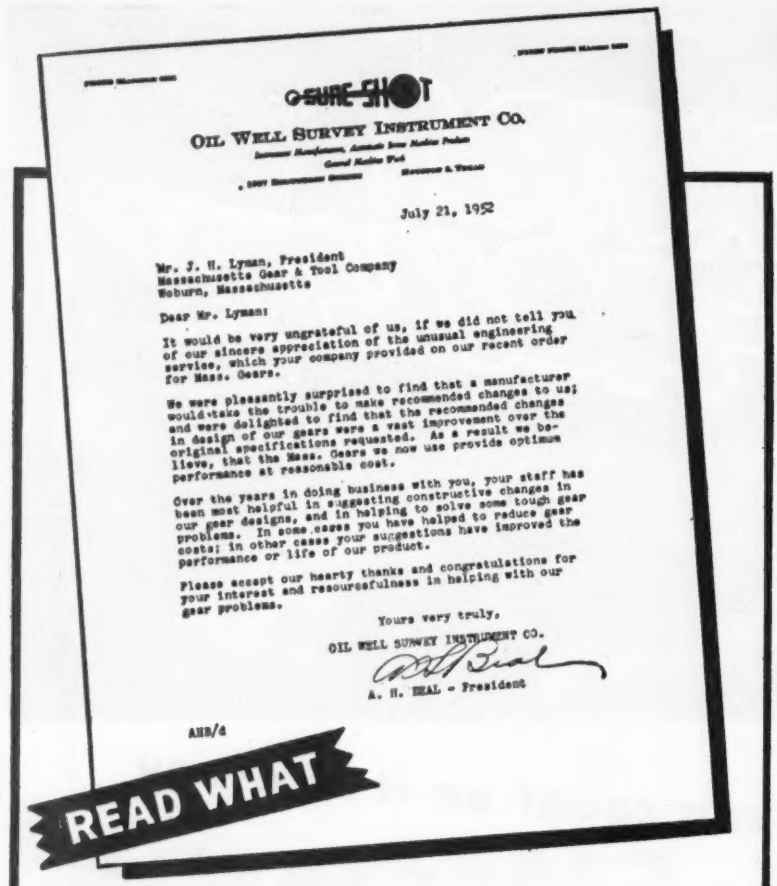
Power Hack Saw Blade


THERE'S A RIGHT "RED END"
BLADE FOR EVERY JOB!
HIGH SPEED MOLYBDENUM — the RED Blade for cutting mild alloy steels and general purpose use.
HIGH SPEED TUNGSTEN — the GREY Blade for cutting hard alloys and stainless steels.
HIGH SPEED WELD-EDGE — the SHATTERPROOF Blade for use where maximum safety is required.
SIMONDS

It's the *plus* you get in "Red End" Blades that makes the difference in overall performance, cutting life and dependability . . . a *plus* that starts with Simonds extra tough Hack Saw Steel, poured and rolled in Simonds own steel mill . . . followed by proven know-how in milling and setting the teeth and in heat-treating for uniform hardness and toughness of every blade. A choice of three types of job-designed blades in all standard sizes is another *plus* that pays off in extra cut-ability and lower hack saw costs for you. Get delivery from stock from your Industrial Supply Distributor.

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.

Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon. Canadian Factory in Montreal, Que.
Simonds Divisions: Simonds Steel Mill, Lockport, N. Y., Simonds Abrasive Co., Phila., Pa. and Arvida, Que., Canada


SURE-SHOT
OIL WELL SURVEY INSTRUMENT CO.
July 21, 1952
Mr. J. H. Lyman, President
Massachusetts Gear & Tool Company
Woburn, Massachusetts
Dear Mr. Lyman:
It would be very ungrateful of us, if we did not tell you of our sincere appreciation of the unusual engineering service, which your company provided on our recent order for Mass. Gears.
We were pleasantly surprised to find that a manufacturer would take the trouble to make recommended changes to us; and were delighted to find that the recommended changes in design of our gears were a vast improvement over the original specifications requested. As a result we believe, that the Mass. Gears we now use provide optimum performance at reasonable cost.
Over the years in doing business with you, your staff has been most helpful in suggesting constructive changes in our gear designs, and in helping to solve some tough gear problems. In some cases your suggestions have improved the costs; in other cases you have helped to reduce gear performance or life of our product.
Please accept our hearty thanks and congratulations for your interest and resourcefulness in helping with our gear problems.
Yours very truly,
OIL WELL SURVEY INSTRUMENT CO.
A. H. HEAL - President
AHH/d
READ WHAT

OIL WELL SURVEY INSTRUMENT CO.,
Instrument Manufacturers, Automatic Screw Machine Products and General Machine Work, has to say about
MASS GEARS' *"unusual engineering service" and suggestions that "have improved the performance of our product"*
Ask for help on your gear problems. Send for illustrated literature.

Mass. Gears
Massachusetts Gear & Tool Co.
Woburn, Mass.

MARKING MACHINES AND DEVICES
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.

MEASURING MACHINES AND INSTRUMENTS, Precision
Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Homestrand, Inc., Larchmont, N. Y.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Micn.

MEASURING WIRES, THREAD, SPLINE AND GEAR
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

METAL, Bearings
See Bearings, Bronze, Babbitt, Etc., and Bushings, Brass, Bronze, Etc.

METERS
See Recording Instruments.

MICROMETERS
Ames, B. C., Co. (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Inter-Continental Trading Corp., 90 West St., New York 6, N. Y.
Millers Falls Co., Greenfield, Mass.
Neise, Karl, A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

MICROSCOPES, Toolmakers
Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

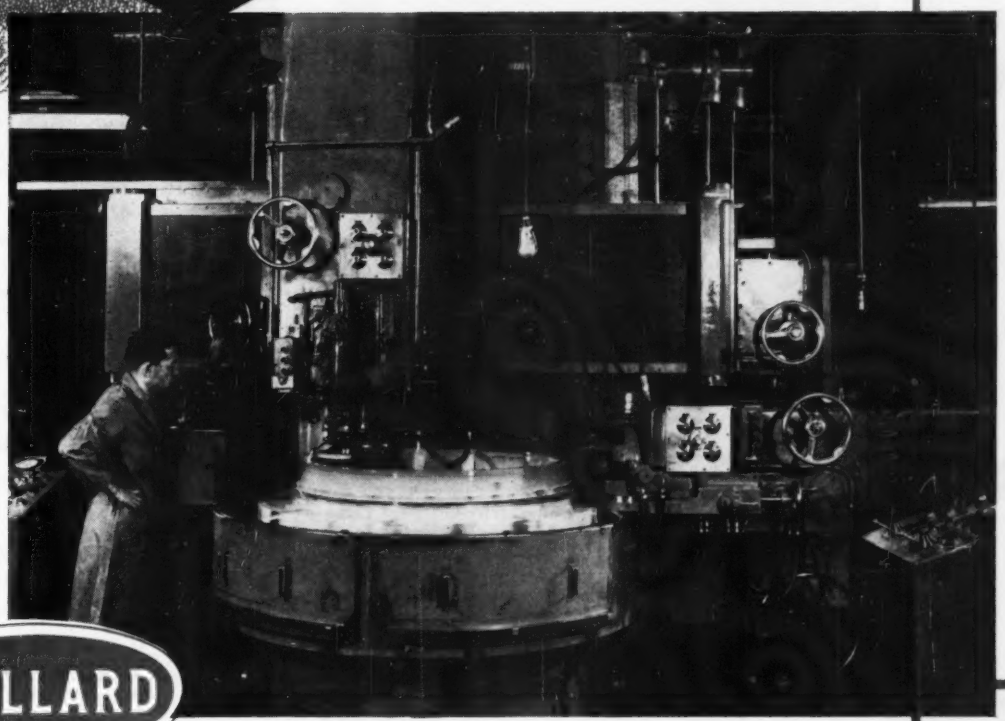
MILLING ATTACHMENTS
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Porter-Cable Machine Co., Salina St., Syracuse, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING AND CENTERING MACHINES
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Jones & Lamson Mch. Co. (Automatic), 160 Clinton St., Springfield, Vt.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Automatic
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.

(Continued on page 380)

NOW VERTICAL CHUCKING Grinders BY BULLARD



BULLARD

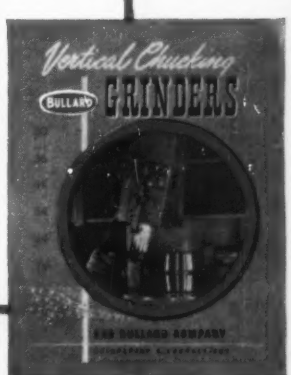
Bullard presents a carefully engineered and developed Vertical Chucking Grinding Machine in a range of sizes to meet present day requirements for conveniently grinding the larger sizes of work.

Years of study of field requirements for a truly accurate machine of this kind have produced this Vertical Chucking Grinding Machine now in production at the plant of TIMKEN BEARING CO. Canton, Ohio.

It is designed and built with Bullard characteristic Vertical Turret Lathe ruggedness and rigidity, combined with the sensitivity of control and built in precision so essential for successful grinding results.

Precision, flexibility of control, safety design and productive efficiency place THIS LINE OF VERTICAL CHUCKING GRINDING MACHINES as an IMPORTANT item on your list for immediate investigation.

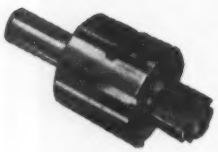
Write now for Delivery dates and complete information, ask for VG-6S.

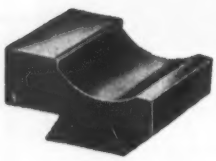


THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

with *Gorham*-ENGINEERED SPECIAL CUTTING TOOLS





Next time you're up against a tough tooling problem, call in the man who can give you *the right answers fast* . . . your nearby Gorham Field Engineer! He's an expert in special cutting tools . . . and he's ready to provide a complete engineering service to determine your exact tooling requirements. He starts with your product, sketch or idea. He surveys your production operations and available equipment. He considers work material properties and desired finishes and tolerances. He plots proper machine feed, speed and method of tool driving. Then he develops practical design and engineering specifications for special cutting tools, metallurgically "tailor-made" for your application.

His recommendations are backed by Gorham's unmatched facilities, which include three fully-equipped modern plants, a large Engineering and Metallurgical staff, and a force of field application engineers in principal industrial centers, coast-to-coast. All are dedicated to furnishing prompt and profitable solutions to your special tooling problems. Gorham-engineered "specials" are turning problems into profits in thousands of plants every day . . . why not let them do the same for *you?* If you haven't met your nearby Gorham Field Engineer, write for his name, or send details of your problem direct for recommendations.

Gorham TOOL COMPANY

"EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"

14405 WOODROW WILSON • DETROIT 3, MICHIGAN

WEST COAST WAREHOUSE: 576 North Prairie Ave., Hawthorne, Calif.

Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Hall Planetary Co., Fox St. and Abbotsford Ave., Philadelphia 29, Pa.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Kearney & Trecker Corp., Milwaukee, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

MILLING MACHINES, Bench

Hardinge Bros., Inc. (Bench or Pedestal Type), 1418 College Ave., Elmira, N. Y.
Pratt & Whitney, West Hartford 1, Conn.

MILLING MACHINES, Circular Continuous

Consolidated Machine Tool Corp., Rochester, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Hall Planetary Co., Fox St. and Abbotsford Ave., Philadelphia 29, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Duplex

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

MILLING MACHINES, Hand

Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Horizontal, Plain and Universal

Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Marac Mchry. Corp., 1819 Broadway, New York, N. Y.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sheldon Machine Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

(Continued on page 382)

This new booklet shows you how Kodak Contour Projectors can simplify your inspection and measurement problems

Just off the press is the most informative booklet on Kodak Contour Projectors we've ever published.

- It shows by example and case history how you can inspect large parts, small parts, long parts, curved parts, delicate parts, complex parts, all sorts of parts on the Kodak Contour Projector.
- It gives details of both the Model 2A for precision micrometry, and the Model 3 for fast, routine gaging.
- It describes the features that make Kodak Contour Projectors adaptable to such a wide variety of work.
- It lists the accessories that extend their versatility.
- It discusses the measuring attachments that provide critical accuracy.

Whether your interest lies in toolroom measurement or production assembly and inspection, Kodak Contour Projectors will do the job quickly, completely, and accurately with little training of operators. For complete details, send for your complimentary copy of this new 12-page booklet. Just write to Eastman Kodak Company, Industrial Optical Sales Division, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Optical Gaging

A new sound movie, Optical Gaging, shows how to simplify complex inspection problems. We'll tell you how to get it for a showing.

Kodak

MILLING MACHINES, Lincoln Type

Brown & Sharpe Mfg. Co., Providence, R. I.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Planer Type

Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn. R. R., Evanston, Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Pratt & Whitney, West Hartford 1, Conn.

MILLING MACHINES, Planetary Type

Hall Planetary Co., Fox St. and Abbotsford Ave., Philadelphia 29, Pa.

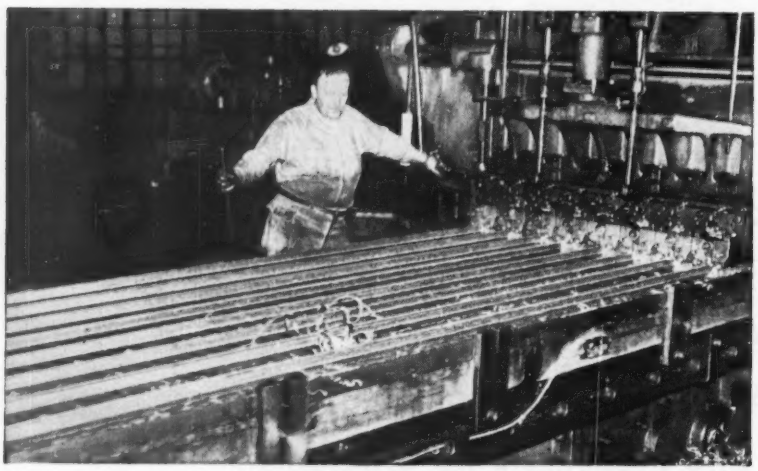
MILLING MACHINES, Profile

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Ram Type Universal

Van Norman Co., 3640 Main St., Springfield 7, Mass.

Walker Magnetic Chuck Reduces Production Time 50 Per Cent.



The problem: Hold guide rails 8′ to 16′ long with small cross section; planed in units of eight, three tool bits per rail. Chuck must hold against twenty-four cutting edges, 90 sfpm, feed 0.060″. Close tolerance and finish necessary — tool bits and work pieces cannot be magnetized.

Solution: Walker engineers recommended a chuck installation 60″ x 198″ with *balanced magnetic circuit* essential to proper chip control. The holding power of this installation is more than 200 psi.

Result: Set-up simplified . . . danger of distortion minimized . . . *two men* now doing a planing job which formerly required *three* . . . production time per piece cut in half . . . work pieces have better and closer tolerances. Neither tools nor rails are magnetized.

Walker Does It Again

O. S. WALKER CO. Inc.
WORCESTER 6, MASSACHUSETTS
Original Designers and Builders of Magnetic Chucks

In Canada—Upton Bradeen & James, Ltd.

MILLING MACHINES, Turret Type

Bridgeport Machine, Inc., Linley Ave., Bridgeport, Conn.

MILLING MACHINES, Vertical

British Industries Corp., International Mchry. Div., 164 Duane St., New York, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ekstrom, Carlson & Co., 1437 Railroad Ave., Rockford, Ill.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Marac Mchry. Co., 1819 Broadway, New York N. Y.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

MODEL AND EXPERIMENTAL WORK

See Special Machinery and Tools.

MOLD AND DIE COPYING MACHINES

Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Pratt & Whitney, West Hartford 1, Conn.

MOLDING MACHINES, Plastic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

MOTORS, Electric

Delco Products Div., General Motors Corp., 321 E. First St., Dayton, Ohio.
General Electric Co., Schenectady, N. Y.
Reliance Electric & Engrg. Co., Collinwood Sta., 1088 Ivanhoe Rd., Cleveland, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

MOTORS, Hydraulic

Gerotor May Corp., Oliver St. and Maryland Ave., Baltimore, Md.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Sundstrand Machine Tool Co., 2531 11th St. Rockford, Ill.

MULTIPLE-SLIDE FORMING MACHINES

Nilson Machine Co., A. H., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St. Ampere, N. J.

NIBBLING MACHINES

Campbell Machine Div., American Chain & Cable Co., Inc., 929 Connecticut Ave., Bridgeport, Conn.
Wales-Strippit Corp., North Tonawanda, N. Y

NIBBLING MACHINES, Nickel

International Nickel Co., Inc., 67 Wall St., New York, N. Y.

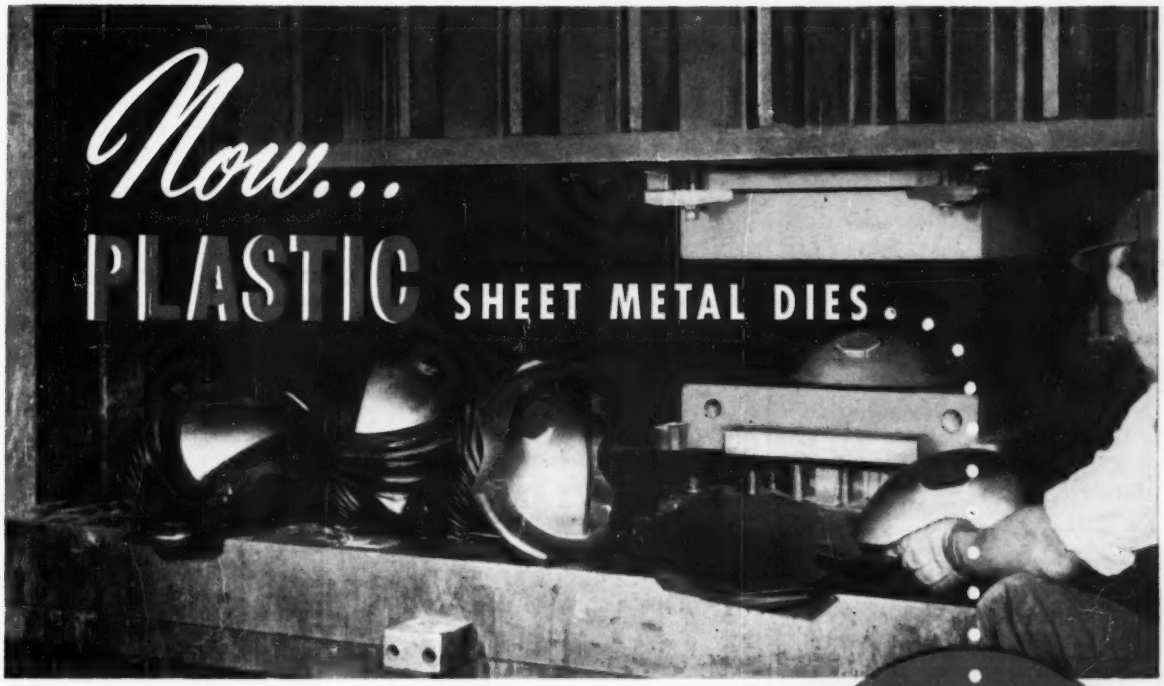
NIPPLE THREADING MACHINERY

Landis Machine Co., Inc., Waynesboro, Pa.

NUT MAKING MACHINERY

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

(Continued on page 384)



To meet the need for lowest-cost short run dies which can be produced quickly and accurately, Richard Brothers Division is now equipped to supply plastic dies.

Rezolin tool plastic material, which has proved to have good wearing qualities and stability, is being used for these dies. Because this material does not expand or shrink, dies can be made to extreme accuracy and with a minimum of final fitting and tryout. On short run production such as that illustrated—experimental flywheel housing covers of 20 gauge steel—the use of plastic dies results in definite savings both in initial cost and time required for delivery.

With the addition of the equipment and specially trained personnel required to produce plastic dies, Richard Brothers Division is now in a position to supply sheet metal dies exactly suited to any production requirement. Allite zinc alloy dies meet the needs for experimental or short run work where quantities exceed the limitations of plastic dies. For high production runs, iron dies of every type and size can be built. In many cases, combinations of materials can be utilized to provide maximum economy without sacrifice in die performance.

The best sheet metal die for the purpose . . . the most economical die for the purpose . . . can always be built for you by Richard Brothers Division. Write us for full details.

Rounding out a
COMPLETE
SHEET METAL DIE SERVICE

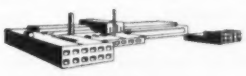
Other Allied Products

HARDENED AND PRECISION GROUND PARTS • SPECIAL COLD FORGED PARTS • STANDARD CAP SCREWS JIGS • FIXTURES • R-B INTERCHANGEABLE PUNCHES AND DIES

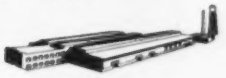
ALLIED PRODUCTS CORPORATION

DEPT. D-10 • 12619 BURT ROAD • DETROIT 23, MICH.

PLANT 1
Detroit, Mich.


PLANT 2
Detroit, Mich.

PLANT 3
Hillsdale, Mich.


PLANT 4
Hillsdale, Mich.

STAMPINGS

PILOT RUNS

SPECIAL METHODS PRODUCE SMALL QUANTITIES AT MINIMUM COST.

When you need just a few pieces — when you're still in the experimental stage—then an economical, cooperative source of parts is important.

Our **Machine-Cut Method** avoids custom die costs completely by use of special machinery which skillfully fashions pilot quantities.

Careful calculation determines the point at which labor costs warrant our **Short Run Method**, which uses simple contour dies and special purpose presses.

Best of all, when you get into large quantities on the experimental part, our STAMPINGS DIVISION is still your most economical producer, using our **Production Method**. Thus all three methods are at your disposal. And impartial choice of method *saves money* for you!

For more information, use coupon on opposite page

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NUT SETTING EQUIPMENT

See Screw Driving and Nut Setting Equipment.

NUT TAPPERS

See Bolt and Nut Machinery.

NUTS, Cold Forged, Wing and Cap

Chicago Screw Co., Bellwood, Ill.
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.
Republic Steel Corp. (Union Drawn Steel Div.), Republic Bldg., Cleveland 1, Ohio.
Union Drawn Steel Co. Div., Republic Steel Corp., Massillon, Ohio.

NUTS, Self-Locking

Grip Nut Co., 310 S. Michigan Ave., Chicago 4, Ill.

NUTS, Thumb or Wing and Cap

Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Republic Steel Corp., Bolt and Nut Div., Republic Bldg., Cleveland 1, Ohio.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

OIL CUPS

Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, Ill.

OIL EXTRACTORS AND CLEANERS

Barnes Drill Co. (Magnetic), 814 Chestnut, Rockford, Ill.
De Laval Separator Co., Poughkeepsie, N. Y.

OIL GROOVERS

Wicaco Machine Co., Stenton Ave. and Louden St., Philadelphia, Pa.

OIL-HOLE COVERS

Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, Ill.

OIL SEALS

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Garlock Packing Co., Palmyra, N. Y.

OILERS AND LUBRICATORS

Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, Ill.
Madison-Kipp Corp., Madison, Wis.

OILS, Cutting

See Cutting and Grinding Fluids.

OILS, Lubricating

Cities Service Oil Co., 70 Pine St., New York, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Sinclair Refining Co., 630 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

OILS, Quenching and Tempering

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Sinclair Refining Co., 630 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St. Chicago 23, Ill.

OILS, Soluble

See Compounds, Cutting, Grinding, Metal Drawing, Etc.

OPTICAL FLATS

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.

ORDNANCE MACHINES, Special

Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.

PACKING, Leather, Metal, Rubber, Asbestos, Etc.

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Garlock Packing Co., Palmyra, N. Y.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PARALLELS

Brown & Sharpe Mfg. Co., Providence, R. I.
Rahn Granite Surface Plate Co., 637 N. Western Ave., Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

PATTERNS, Wood and Metal

Mummert-Dixon Co., Hanover, Pa.

PHOSPHOR BRONZE—See Bronze.

PILLOW BLOCKS

Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Shafer Bearing Corp., Downers Grove, Ill.
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.

PIPE, BRASS AND COPPER

American Brass Co., 25 Broadway, New York, N. Y.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Revere Copper & Brass Inc., 230 Park Ave. New York, N. Y.

PIPE STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
United States Steel Corp., National Tube Co Div., 436 7th Ave., Pittsburgh, Pa.

PIPE THREADING AND CUTTING MACHINES

Landis Machine Co., Inc., Waynesboro, Pa.

PIPE TONGS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

PLANER ATTACHMENTS

Consolidated Mch. Tool Corp., Rochester, N. Y.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn. R. R., Evanston, Cincinnati, Ohio.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.

PLANERS, Double Housing and Openside

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio (Plate).
Consolidated Mch. Tool Corp. (Incl. Plate, Rotary and Crank Types), Rochester, N. Y.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn. R. R., Evanston, Cincinnati, Ohio.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.

PLASTIC AND PLASTIC PRODUCTS

Bakelite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

PLATE ROLLS

Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

PLATES, Angle

Rahn Granite Surface Plate Co., 637 N. Western Ave., Dayton, Ohio.

PLATES, Surface

Brown & Sharpe Mfg. Co., Providence, R. I.
Brush Electronics Co., 3405 Perkins Ave., Cleveland 14, Ohio.
Challenge Machinery Co., Grand Haven, Mich.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Pratt & Whitney Div., West Hartford 1, Conn.
Rahn Granite Surface Plate Co., 637 N. Western Ave., Dayton, Ohio.
Scherr, George, Co., Inc., 200 Lafayette St. New York 12, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

PNEUMATIC EQUIPMENT

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.
Logansport Machine Co., Inc., Logansport, Ind.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

POLISHING LATHES AND MACHINES

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Gardner Machine Co. (Div. Landis Tool Co.), 414 E. Gardner St., Beloit, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Millers Falls Co., Greenfield, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

POLISHING TOOLS, Portable

Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Jarvis, Charles L., Co., Middletown, Conn.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

POWER UNITS, Hydraulic

See Hydraulic Power Units or Tool Heads.

PRESSES, Air

Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.

(Continued on page 386)

SHIMS

BRING YOUR SHIM PROBLEMS TO "SHIM HEADQUARTERS"

ONLY LAMINATED SHIM COMPANY OFFERS YOU ALL FIVE SOLUTIONS:

THE LAMINUM® SHIM

SIMPLY PEELS FOR ADJUSTMENT
Made up of from 3 to 63 layers of .002 or .003 inch brass or steel, metallically bonded together over their entire surfaces. No dirt between layers. Peels with penknife.

THE LAMISOL® SHIM

FOR QUICK, ASSEMBLY LINE USE
The laminations of the LAMISOL Shim (in brass only) are temporarily joined by spot-soldering on the edges. Gauges and number of laminations within one shim are unlimited.

THE LAMITAB® SHIM

FOR SUPER SPEED, THIN GAUGE SITUATIONS
The little tab holds shim laminations together firmly, yet is easily removed. Different metals can be used in the same shim.

THE LOOSE LEAF SHIM

FOR UNLIMITED FLEXIBILITY
This is the simplest of all custom-stamped shims. It is completely flexible. Usually sets including several different gauges are made up.

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READY FOR EASY USE, WITHOUT WASTE
Thin gauge 6" x 100" rolls feed through package slots. Heavier gauges in flat envelopes. Available from your Industrial Distributor.

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"Under actual tests, LUBRIPLATE extended bearing life fifty per cent or better as compared to other lubricants. It was also found that, during test, LUBRIPLATE increased efficiency of machines twenty per cent by reducing friction loss. Republic has been using LUBRIPLATE successfully for the past eight years."

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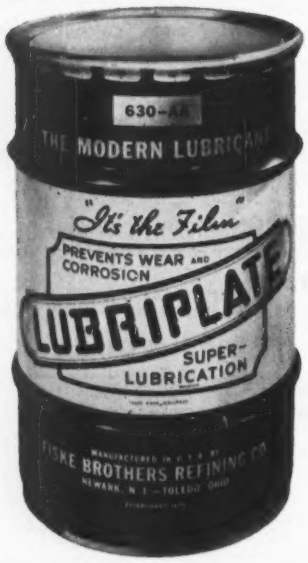
REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.



PRESSES, Arbor

Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
duMont Corp., Greenfield, Mass.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Logansport Machine Co., Inc., Logansport, Ind.
Tomkins-Johnson Co., 614 No. Mechanic St., Jackson, Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.

PRESSES, Broaching

American Broach & Mch. Co., Ann Arbor, Mich.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Colonial Broach Co., Detroit 13, Mich.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PRESSES, Extrusion

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PRESSES, Foot

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

PRESSES, Forging

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E. Cleveland, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Morgan Engrg. Co., Alliance, Ohio.
National Mchry. Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

PRESSES, Hydraulic

American Broach & Mch. Co., Ann Arbor, Mich.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W. Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Columbia Mchry. & Engrg. Co., Hamilton 1, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.

PRESSES, Pneumatic

Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.

PRESSES, Screw

Bliss Co., E. W., 1375 Raff Rd., S. W. Canton, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

PRESSES, Sheet Metal Working

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Ave., Cincinnati, Ohio.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Columbia Machinery & Engineering Corp., Hamilton 1, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Johnson Mch. & Press Corp., 620 W. Indiana Ave., Elkhart, Ind.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
L & J Press Corp., Elkhart, Ind.
Minster Machine Co., Minster, Ohio.

(Continued on page 388)

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HOTFORM The original 5.00% chromium hot work steel—more widely used than any other type. Ideal for die casting dies, shell piercing tools, extrusion press tooling (for aluminum, magnesium, soft brass).

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Vanadium-Alloys Die Steels for Hot Work are produced in grades covering the complete range of applications in this field. Each grade, distinguished by brand, embodies the specialized experience of almost half a century devoted *exclusively* to the production of fine tool and die steels. Whatever your hot work requirements, you'll find profitable fulfillment in our First Quality Die Steels. Our Research Department and metallurgically-trained sales representatives will gladly assist you in correct selection. *Let us send you our booklet on Die Steels for Hot Work.*

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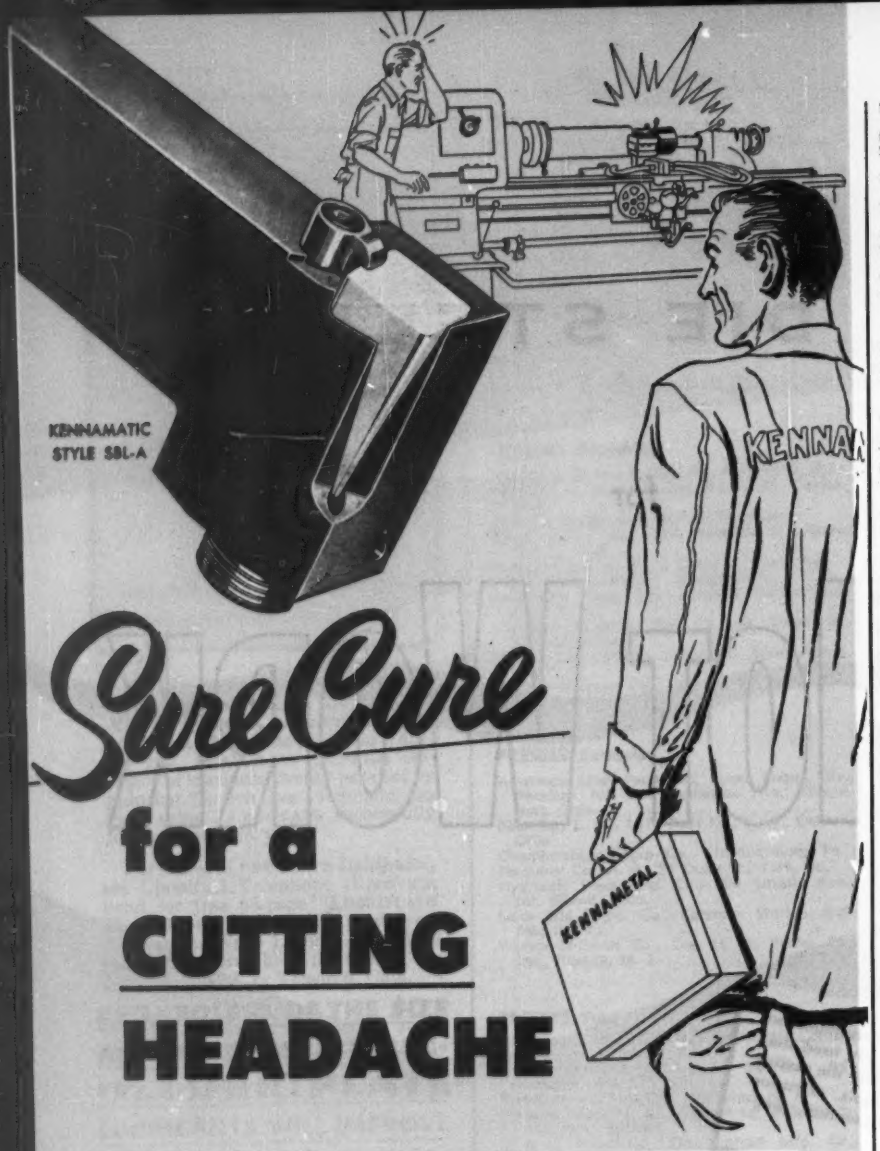

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If you have a cutting headache, caused by tool failure, take this three-way cure:

(1) Use Kennametal cemented carbide . . .

(2) in tooling designed by our engineers who know carbides from the ground floor up . . .

(3) applied with the help of our field engineers whose aggregate experience is greater than that of any other carbide tool manufacturer.

This cure is working in thousands of shops—handling jobs which no other tools can do. But, even if you don't have a cutting headache, consider this important point:

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That tooling is Kennametal. Let us prove it in your shop. Kennametal Inc., Latrobe, Pa.

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Peck, Stow & Wilcox Co, Southington, Conn.
Sales Service Mch. Tool Co., 2363 University Ave., St. Paul, Minn.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Wales-Strippit Corp., North Tonawanda, N. Y.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

PRESSES, Straightening

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Mch. & Tool Works (Hydraulic), 683 Northland Ave., Buffalo, N. Y.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Springfield Mch. Tool Co., Springfield, Ohio.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.

PROFILING MACHINES

Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, George, Machine Co., 1110 W. 13th St., Racine, Wis.
Morey Mchry. Co., Inc., (and Affiliated companies), 410 Broome St., New York, N. Y.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

PULLEYS

Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

PULLEYS, Friction Clutch

Brown & Sharpe Mfg. Co., Providence, R. I.

PUMPS, Coolant, Lubricant and Oil

Bowser, Inc., 1365 E. Creighton Ave., Fort Wayne, Ind.
Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., Rockwell Mfg. Co., 620 E. Vienna Ave., Milwaukee, Wis.
Ingersoll-Rand Co., Phillipsburg, N. J.
Logansport Machine Co., Inc., Logansport, Ind.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Ruthman Machinery Co., 1809 Reading Rd., Cincinnati 12, Ohio.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Tomkins-Johnson Co., Jackson, Mich.
Tuthill Pump Co., 939 E. 95th St., Chicago 19, Ill.
Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engrg. Co., Chambersburg, Pa.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Gerotor May Corp., Oliver St. and Maryland Ave., Baltimore, Md.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Ingersoll-Rand Co., Phillipsburg, N. J.

(Continued on page 390)

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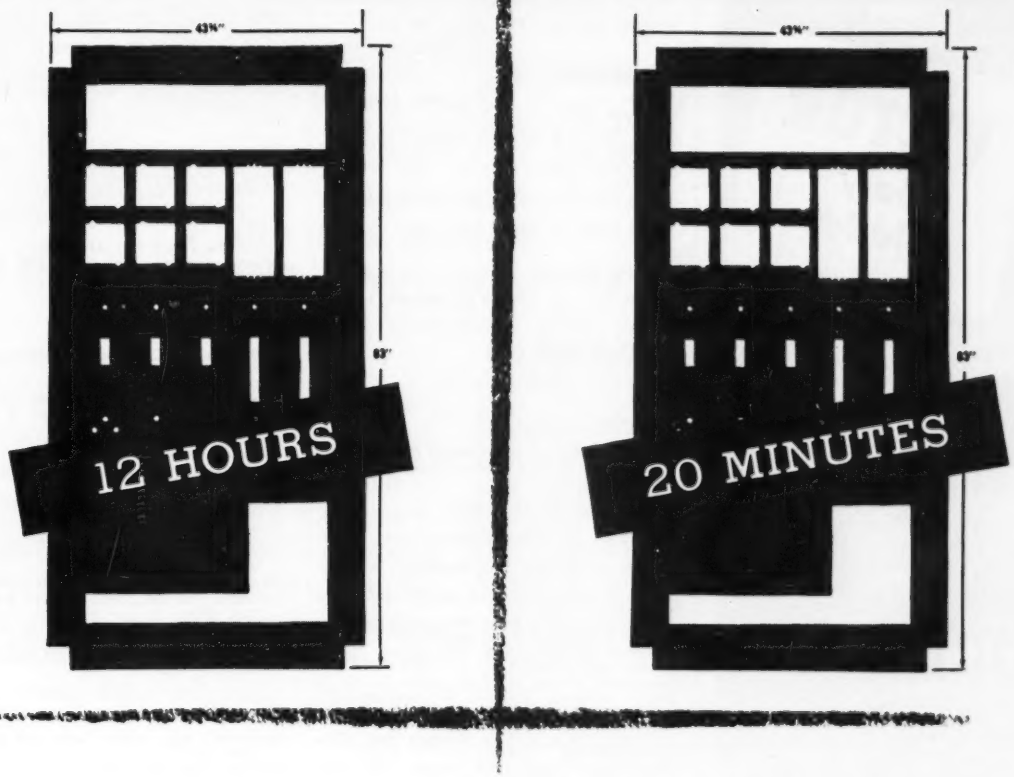

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Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Kling Bros., Engineering Works, 1320 No. Kostner Ave., Chicago 51, Ill.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Wales-Strippit Corp., North Tonawanda, N. Y.
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Wiedemann Machine Co., 4272 Wissahickon Ave., Philadelphia, Pa.

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Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Massachusetts Gear & Tool Co., 36 Nassau St., Woburn, Mass.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

REAMER HOLDERS

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Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Warner & Swasey Co., 8701 Carnegie Ave., Cleveland 3, Ohio.

REAMERS

Atrax Co., Newington, Conn.
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

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Barber-Colman Co., Rock and Montague, Rockford, Ill.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Madison Mfg. Co., Muskegon Heights, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

REAMERS, Taper Pin

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Kaufman Manufacturing Co., Manitowoc, Wis.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

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Kaufman Manufacturing Co., Manitowoc, Wis.
Magna Engineering Corp., 110 Linfield Drive Menlo Park, Calif.
Pratt & Whitney, West Hartford 1, Conn.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

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National Acme Co., 170 E. 131st St., Cleveland Ohio.

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Bristol Co., Platts Mills, Waterbury, Conn.
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(Continued on page 392)

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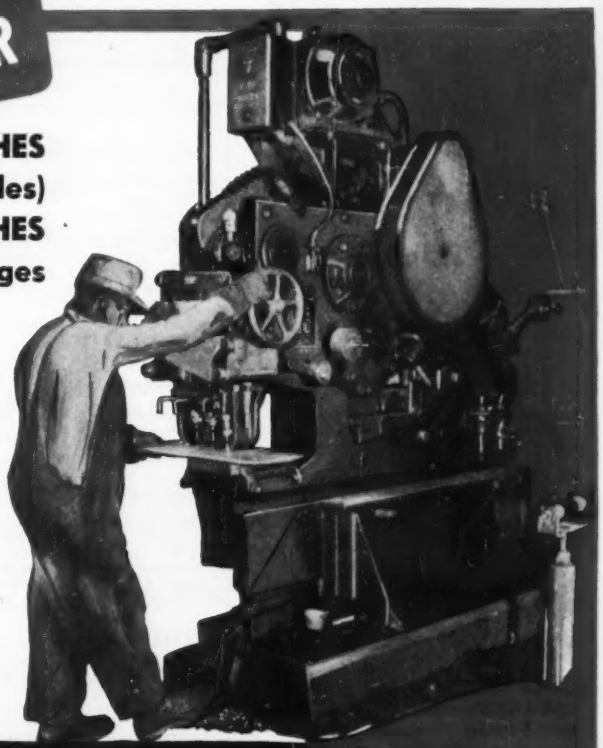
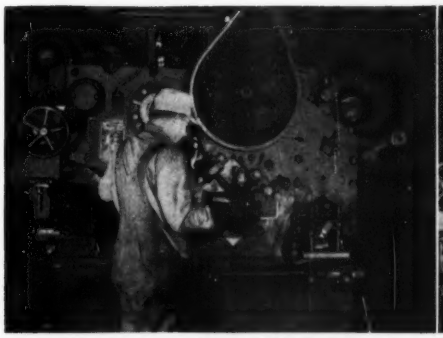
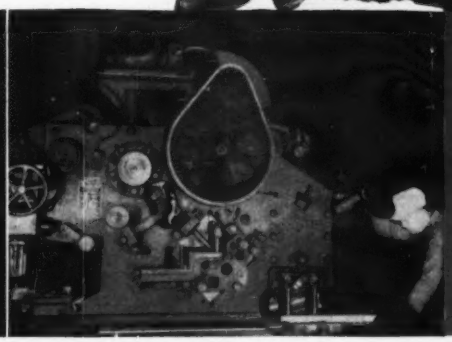




Cutting a 3 x 3 x ¼" angle



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Peck, Stow & Wilcox Co, Southington, Conn.

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Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

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Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ingersoll-Rand Co., Phillipsburg, N. J.
Jarvis, Charles L., Co., Middletown, Conn.
Keller Tool Co., Grand Haven, Mich.
Millers Falls Co., Greenfield, Mass.
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Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

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Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Millers Falls Co., Greenfield, Mass.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Victor Saw Works, Inc., Middletown, N. Y.

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Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

SAWING MACHINES, Circular

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(Continued on page 394)

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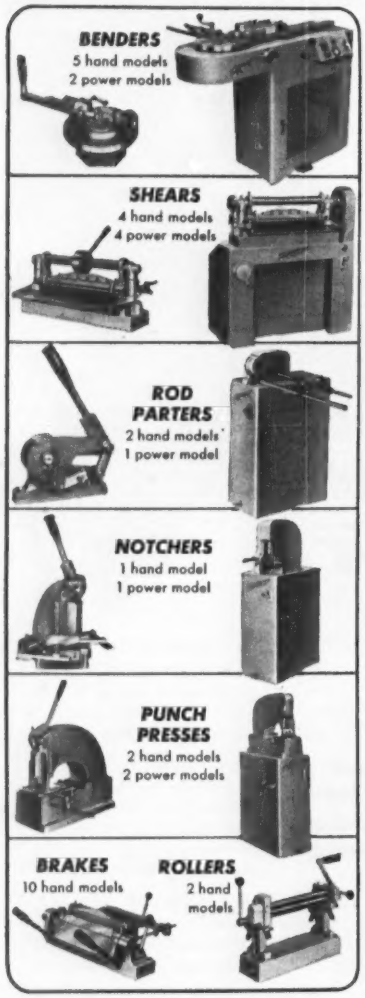

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Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Tannewitz Works, 301-325 Front Ave., N. W., Grand Rapids 2, Mich.
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Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
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Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
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Jarvis, Charles L., Co., Middletown, Conn.
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Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
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New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
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Standard Pressed Steel Co., Jenkintown, Pa.
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Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
National Acme Co., 170 E. 131st St., Cleveland Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

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See also Lathes, Turret.

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Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
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Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.
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(Continued on page 396)

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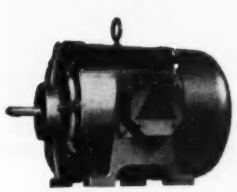
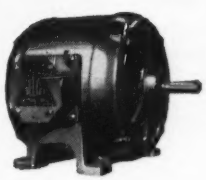
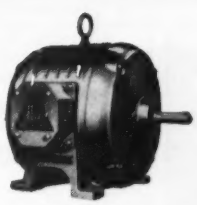


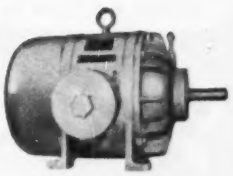
Totally Enclosed Fan-Cooled Motor



Open Ball-Bearing Motor



Totally Enclosed Motor



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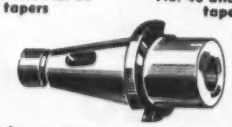

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(Continued on page 398)

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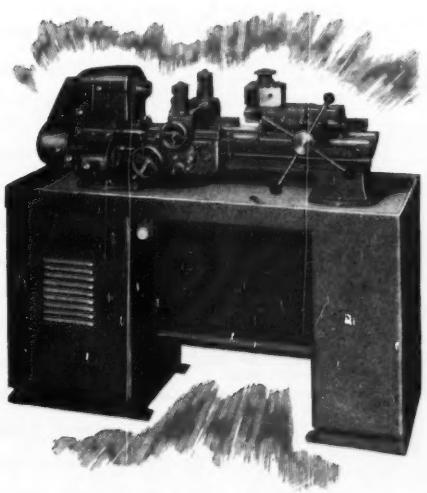

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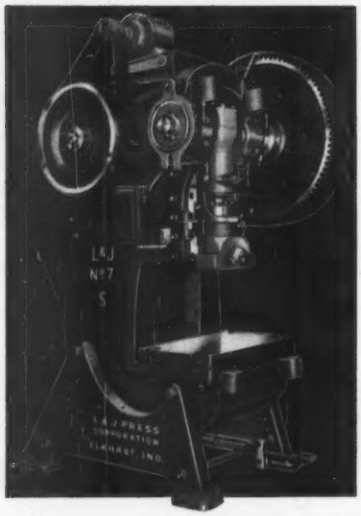

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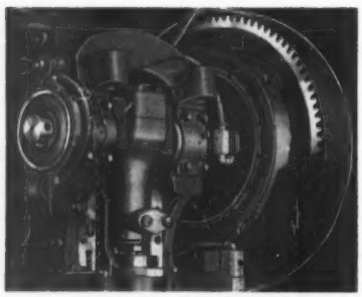

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(Continued on page 402)

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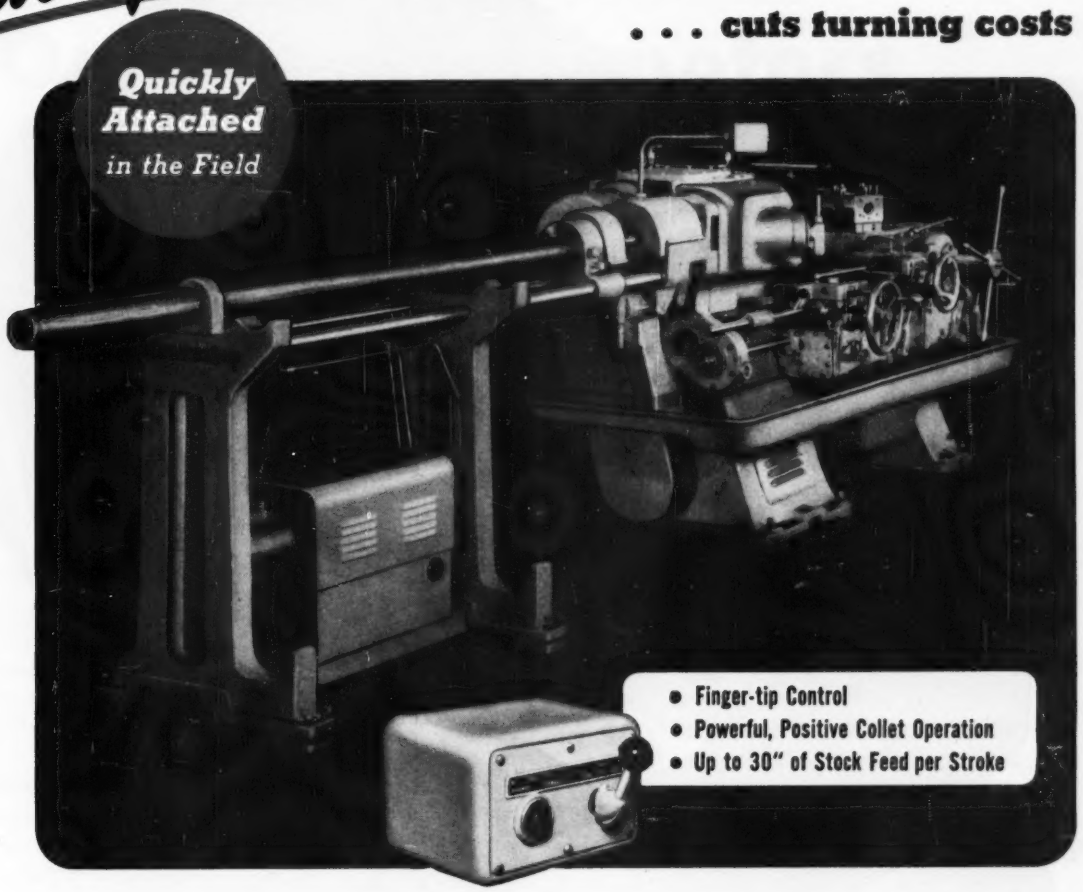

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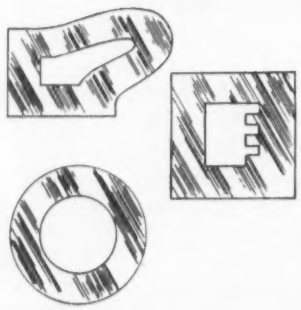

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Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

STAMPINGS, All Metal

LaSalle Steel Co., Hammond, Ind.

STAMPINGS, Sheet Metal

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Dayton Rogers Mfg. Co., 2824 13th Ave., S., Minneapolis 7, Minn.
Laminated Shim Co., Inc., Glenbrook, Conn.
Republic Steel Corp., Niles Steel Products Div., Republic Bldg., Cleveland 1, Ohio.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

STAMPS, Steel and Marking Dies

Hoggson & Pettis Mfg. Co., 149 Brewery St., New Haven, Conn.

STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Frasse, Peter A., & Co., Inc., 17 Grand St., New York 13, N. Y.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.
U. S. Steel Supply Div., U. S. Steel Co., 208 S. La Salle St., Chicago 4, Ill.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Cold Drawn

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel & Shafting Co., P. O. Box 1557 Pittsburgh 30, Pa.

(Continued on page 404)

Years of B&D development pay off for you in high-speed, high-precision grinding!

ALL-NEW! BLACK & DECKER No. 8 DIE GRINDER only $85.00

ALL-NEW POWER! Powerful Black & Decker motor—smallest in any B&D Tool—designed and built by the recognized world's leader in the field!

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ALL-NEW COMPACTNESS! Overall length is only 11¾". Main housing diameter is only 2⅛" for convenient, accurate handling. And it weighs only 2⅛ lbs!

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B&D Black & Decker PORTABLE ELECTRIC TOOLS

BLACK & DECKER 34 Factory Branches SERVICE

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Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Union Drawn Steel Div., Massillon, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co., Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, High Speed Tool

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Machine

Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Timken Roller Bearing Co., Canton, Ohio.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Stainless

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Frasse, Peter A., & Co., Inc., 17 Grand St., New York 13, N. Y.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Strip and Sheet

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Frasse, Peter A., & Co., Inc., 17 Grand St., New York 13, N. Y.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

STEEL, Tool and Die

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., Reading, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Vanadium Alloys Steel Co., Latrobe, Pa.

STEEL, Zinc, Tin and Copper Coated Strip

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.

STEEL ALLOYS

See Alloys, Steel.

STEEL BARS—See Bars, Steel.

STEEL STOCK GROUND FLAT

Brown & Sharpe Mfg. Co., Providence, R. I.
Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.
Starrett, The L. S., Co., Athol, Mass.

STELLITE

Haynes Stellite Div., Union Carbide & Carbon Corp. (Alloy), 30 E. 42nd St., New York, N. Y.

STOCKS, Die

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.

STONES, Oil or Sharpening

Bay State Abrasive Co., Westboro, Mass.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Norton Co., 1 New Bond St., Worcester 6, Mass.

STOOLS

Standard Pressed Steel Co., Jenkintown, Pa.

STRAIGHTEDGES

Rahn Granite Surface Plate Co., 637 N. Western Ave., Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.

STRAIGHTENERS, Flat Stock and Wire

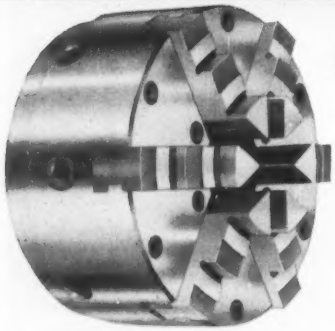
Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

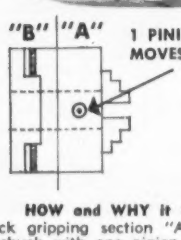
STRAIGHTENING MACHINERY

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., Detroit 13, Mich.
Columbia Machinery & Engineering Corp., Hamilton 1, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Springfield Mch. Tool Co., Springfield, Ohio.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

(Continued on page 406)

The UNIVERSAL Chuck with .0005 PRECISION!





HOW and WHY it works

Chuck gripping section "A" is like any scroll chuck with one pinion to move jaws (accurate to .003"). Section "B" shows how chuck "floats" on adapter (.020" clearance) where 4 opposed screws move chuck on adapter for adjustment to dead true precision. Jaws always come back within .0005" on duplicate work.

Buck AJUST-TRU CHUCKS

6 JAW 6" CHUCK HANDLES WORK OF 93 COLLETS!

The capacity of $1,000 worth of collets for your tool room PLUS scroll chuck rechucking speed on duplicate parts with .0005" precision . . .

The firm grip of 6 jaws for soft metal or tube work . . .

An end to most needs for stub arbors, mandrels, or special fixtures . . .

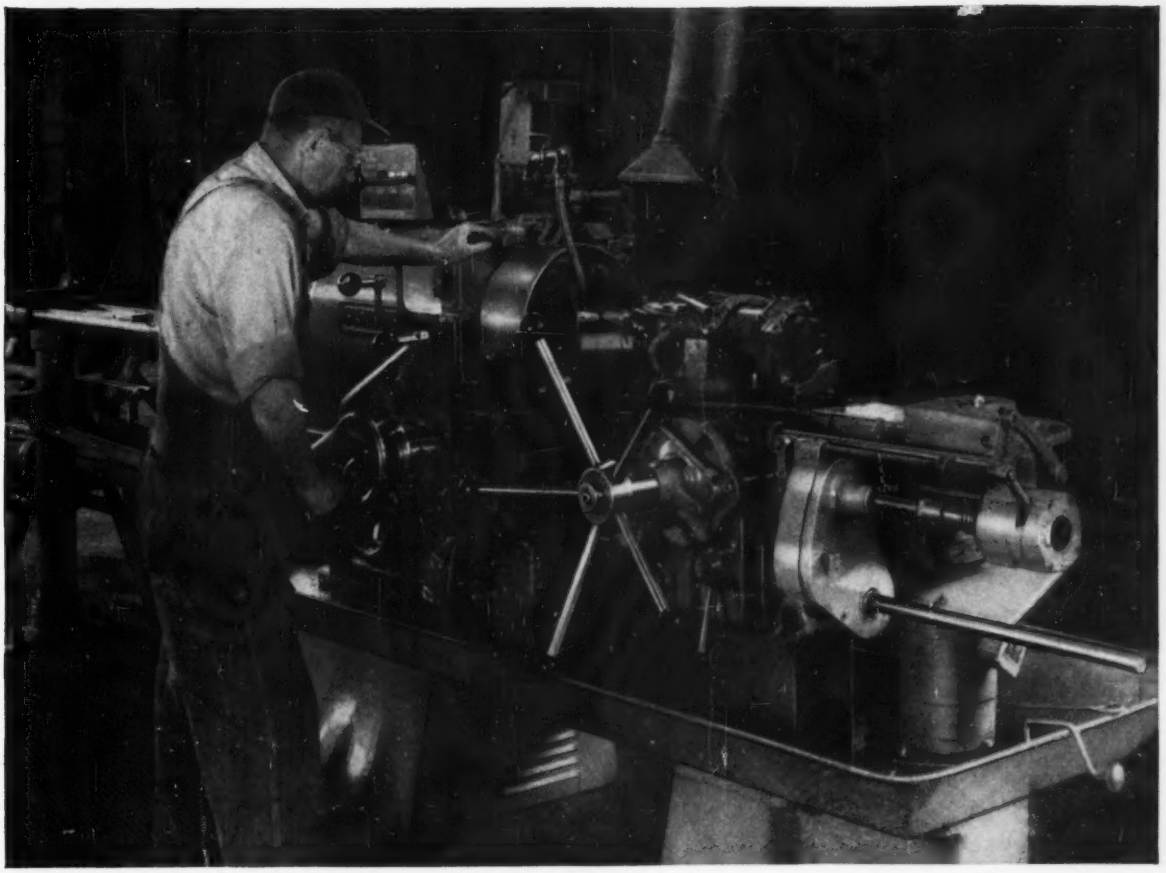
A reliable precision chuck adaptable to lathes, screw machines, grinders, dividing heads . . .

The greatest development of recent years to save machinists' time . . .

That's the brief story of this sensational Ajust-Tru chuck. It is unbelievable—but true! Send for catalog with full details.

SIZES AVAILABLE:
3- and 6-Jaw Chuck—4" (light duty)
5", 6", 7½" (heavy duty)
2-Jaw Aviation Chuck—6", 7½" (heavy duty)

BUCK TOOL CO.
220 Schippers Lane • Kalamazoo, Mich.



MACHINING FOR GOLD at Homestake

with Gisholt Turret Lathes

Yes, gold mining means machinery. And here at the famous Homestake Mine at Lead, South Dakota, Gisholt Turret Lathes help to machine the machines that dig for gold. It's a big job, too—turning out the variety of rock bits and drill rods that are used up in large numbers.

This Gisholt Ram Type Lathe was first used to turn the plain ends on the one-inch quarter-octagon drill steel for two types of rock bits. Production averaged 30 an hour. Now, the machine is also used to machine and thread three sizes of forged steel drill rods. Besides all this, the Gisholt has the job of facing and chamfering the chuck, or shank ends, of the drill steel so that a perfectly flat face is hit by the drill machine tappet.

Here, again, Gisholt Ram Type Turret Lathes prove their easy change-over and ability to produce profitably, even on small runs—big assets in any machine shop. Ask your nearest Gisholt representative about them. Or write us.

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Madison 10, Wisconsin

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Wales-Strippit Corp., North Tonawanda, N. Y.

STUD SETTERS

Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.

SUB-PRESSES

Waltham Machine Works, Newton St., Waltham, Mass.

SUPERFINISHING MACHINES

Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.

SURFACE PLATES

See Plates, Surface.

SWAGING MACHINES

Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Torrington Co., Torrington, Conn.

SWITCHES

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
Electro-Snap Switch & Mfg. Co., 4218-30 West Lake St., Chicago 24, Ill.
General Electric Co., Schenectady, N. Y.
Micro Switch Div., Minneapolis-Honeywell Regulator Co., Freeport, Ill.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

TACHOMETERS

Bristol Co., Platts Falls, Waterbury, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

TAPER PINS, Standard

Chicago Screw Co., Bellwood, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.

TAP HOLDERS

Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.

TAPPING ATTACHMENTS AND DEVICES

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Homestrand, Inc., Larchmont, N. Y.
Jarvis, Chas. L., Co., Middletown, Conn.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.

TAPPING MACHINES

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bodine Corp., 317 Mt. Grove St., Bridgeport, Conn.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Challenge Mchry. Co., Grand Haven, Mich.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Greeniee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jarvis, Chas. L., Co., Middletown, Conn.
Kaufman Manufacturing Co., Manitowoc, Wis.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Moline Tool Co., 102 20th St., Moline, Ill.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

TAPPING MACHINES, Nut

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

TAPS

Besly-Welles Corp., Beloit, Wis.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Continental Tool Works, Div. Ex-Cell-O Corp., Detroit 32, Mich.
Detroit Tap & Tool Co., Detroit, Mich.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hy-Pro Tool Co., 100 Mt. Pleasant Ave., New Bedford, Mass.
Landis Mch. Co. (Solid Adjustable), Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.
Wood & Spencer Co., 1930 E. 61st St., Cleveland, Ohio.

TAPS, Collapsing

Geometric Tool Co., Westville Station, New Haven 15, Conn.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

TELESCOPES, Alignment

Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.

THERMOMETERS, Indicating and Recording

Bristol Co., Platts Mills, Waterbury, Conn.

THREAD CUTTING MACHINERY

Brown & Sharpe Mfg. Co., Providence, R. I.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Eastern Mch. Screw Corp., New Haven, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.
Hall Planetary Co., Fox St. and Abbotsford Ave., Philadelphia 29, Pa.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kaufman Manufacturing Co., Manitowoc, Wis.
Landis Mch. Co., Waynesboro, Pa.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Pratt & Whitney, West Hartford 1, Conn.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

THREAD CUTTING TOOLS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Detroit Tap & Tool Co., Detroit, Mich.
Eastern Mch. Screw Corp., New Haven, Conn.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Mch. Co., Waynesboro, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

THREAD GAGES

See Gages, Thread.

THREAD GRINDING MACHINES

See Grinding Machines, Thread.

THREAD MILLING MACHINES

Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Hall Planetary Co., Fox St. and Abbotsford Ave., Philadelphia 29, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Waltham Machine Works, Newton St., Waltham, Mass.

THREAD ROLLING MACHINES

Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Salvo Tool & Engineering Co., 26441 Gratiot Ave., Roseville, Mich.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

TIN AND TERNEPLATES

Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp. Div, Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

TOOL BITS, High Speed Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

TOOL BITS, Special Alloy

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.

(Continued on page 408)

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Kennametal, Inc., Latrobe, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

TOOL GRINDERS

See Grinding Machines for Sharpening, Turning and Planing Tools.

TOOL HOLDERS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Lovejoy Tool Co., Inc., Springfield, Vt.
Maxwell Co., 420 Broadway, Bedford, Ohio.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
O. K. Tool Co., Wilton, N. H.
Portage Double Tool Co., 1036 Switzer Ave., Akron 11, Ohio.
R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

TOOLMAKERS' INSTRUMENTS

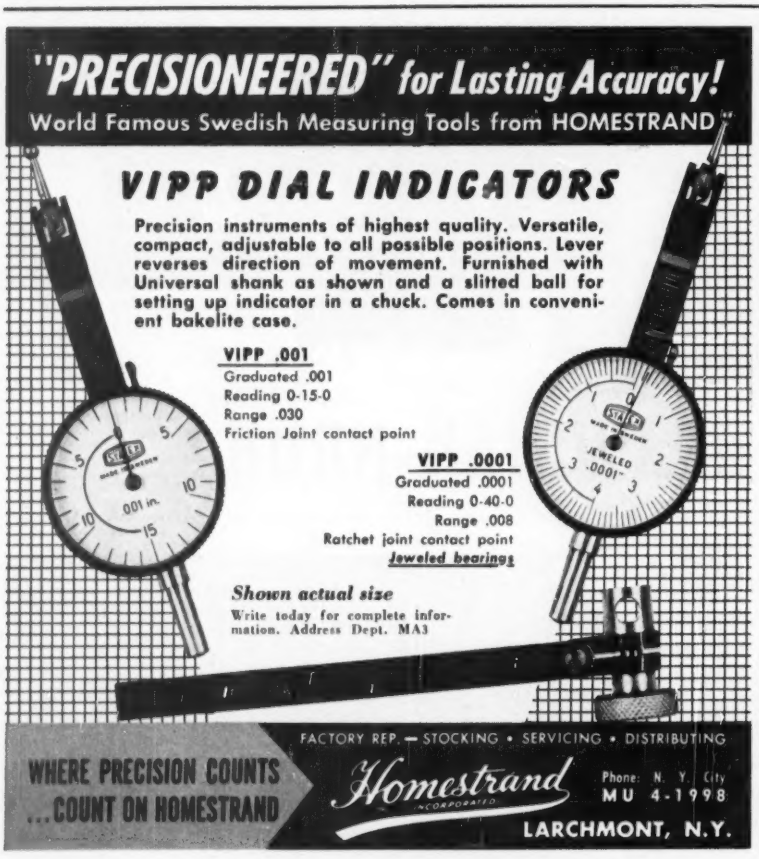
Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.

TOOL STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Vanadium Alloys Steel Co., Latrobe, Pa.

TOOLS, Carbide-Tipped

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Atrax Co., Newington, Conn.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Colonial Broach Co., Detroit 13, Mich.
Kennametal, Inc., Latrobe, Pa.
Maxwell Co., 420 Broadway, Bedford, Ohio.
Metal Carbide Corp., Youngstown, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Metal Corp., Lexington, Ky.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.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TOOLS, Lathe, Shaper and Planer

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Lovejoy Tool Co., Inc., Springfield, Vt.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
O. K. Tool Co., Wilton, N. H.
Super Tool Co., 21650 Hoover Road, Detroit 13, Mich.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

TRANSFER MACHINES, Automatic

Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Colonial Brooch Co., Detroit 13, Mich.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

TRANSFORMERS

General Electric Co., Schenectady, N. Y.

TRANSMISSION, Variable Speed

Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Reliance Elec. & Engrg. Co., Collinwood Station, 1088 Ivanhoe Rd., Cleveland, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

TUBE FLANGING MACHINES

Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.

TUBE FORMING AND WELDING MACHINES

American Elec. Fusion Corp., 2606 Diversey Ave., W., Chicago, Ill.
Yoder Co., 550 Walworth Ave., Cleveland, Ohio.

TUBING, Aluminum

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.

TUBING, Brass and Copper

American Brass Co., 25 Broadway, New York, N. Y.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

TUBING, Flexible

American Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y.
Titeflex, Inc., 500 Frelinghuysen Ave., Newark 5, N. J.

TUBING, Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.

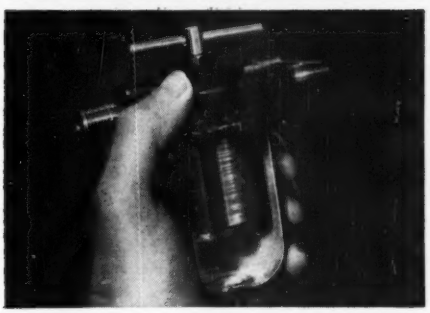
(Continued on page 410)

Here's how this strainer "combs" itself clean!

This simple chalk test shows how AUTO-KLEAN's unique built-in comb construction cleans the strainer without costly interruption of flow

ORDINARY BLACKBOARD CHALK leaves heavy deposit of chalk particles on and between discs of Cuno AUTO-KLEAN strainer.

TURNING HANDLE ONE REVOLUTION moves strainer element through comb blades, removing all traces of chalk from between discs. Cuno's exclusive combing operation cleans *thoroughly* —without stopping flow.



FILTERING AREA IS COMPLETELY CLEAN, restoring full initial capacity. All chalk particles and dirt fall to bottom of housing where they can be drained periodically.

- AUTO-KLEAN's permanent metal filter element is available in steel, brass, or stainless steel for long, trouble-free service.
- AUTO-KLEAN is adaptable to any fluid-flow system.
- From acids to tar . . . if you can pump it, Cuno can filter it. Capacities range from one gallon per hour to 15,000 gallons per minute.

CUNO

ENGINEERED FILTRATION

Removes More Sizes of Solids From More Kinds of Fluids

AUTO-KLEAN (disc-type) • MICRO-KLEAN (fibre cartridge) • FLO-KLEAN (wire-wound)

SINGLE-STRAINER PROTECTION FOR LUBE OILS AND PROCESS FLUIDS

Continuously cleanable AUTO-KLEAN eliminates need for stand-by strainers

AUTO-KLEAN's compact construction gives you full-flow operation in space which would limit ordinary filters to by-pass service. The low pressure drop of AUTO-KLEAN strainers permits this *full-flow* service on gravity, low pressure, high pressure, or suction lines—with no loss in operating efficiency.

Cuno's exclusive "comb-clean" action provides complete cleaning of the filter element—without stopping fluid flow. Thus, there's no need for a stand-by strainer.

The low maintenance costs of the AUTO-KLEAN save you money, for there are no cartridges to change. An occasional rotation of the handle does the cleaning job (most units can be equipped with motor-drives for continuous cleaning).

Fixed-space metal discs in this modern strainer positively remove all solids larger than the specified disc spacing—from .0035" up to .062".

For permanent, positive fluid protection, install compact Cuno AUTO-KLEAN—the precision-built strainer. Send the coupon for free bulletin.

A.3.3

Cuno Engineering Corporation
Dept. 133A, South Vine Street, Meriden, Conn.

Please send me bulletin on Cuno AUTO-KLEAN for .....
(fluid)

Name.....

Company.....

Address.....

City.....Zone....State.....

Frasse, Peter A., & Co., Inc. (Seamless), 17 Grand St., New York 13, N. Y.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Republic Steel Corp., Steel & Tubes Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp., National Tube Co. Div., 436 7th Ave., Pittsburgh, Pa.

TWIST DRILLS

See Drills, Twist.

UNIVERSAL JOINTS

Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

VALVE CONTROLS

Philadelphia Gear Works (Motorized), Erie Ave., and G St., Philadelphia, Pa.

VALVES, Air

Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hunt, C. B., & Son, Inc., 1911 E. Pershing St., Salem, Ohio.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Ross Operating Valve Co., 120 E. Golden Gate, Detroit, Mich.

VALVES, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hunt, C. B., & Son, Inc., 1911 E. Pershing St., Salem, Ohio.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Logansport Machine Co., Inc., Logansport, Ind.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

VIBRATION INSULATION

American Felt Co., Glenville, Conn.

VISES, Machine

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Fenn Mfg. Co., Hartford, Conn.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hendey Machine Co., Inc., Torrington, Conn.
Homestrand, Inc., Larchmont, N. Y.
Logansport Machine Co., Inc., Logansport, Ind.
Martin, J. E. Mch. Works, 548 W. State St., Springfield, Ohio.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

VISES, Pipe

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

VISES, Planer and Shaper

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Martin, J. E., Mch. Works, 548 W. State St., Springfield, Ohio.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

VISES, Pneumatic

Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.

VOLTMETERS

Bristol Co., Platts Mills, Waterbury, Conn.
General Electric Co., Schenectady, N. Y.

WASHERS, Lock

Eaton Mfg. Co., Reliance Div., 25 Charles Ave., S. E., Massillon, Ohio.

WASHERS, Spring

Eaton Mfg. Co., Reliance Div., 25 Charles Ave., S. E., Massillon, Ohio.

WELDING AND CUTTING EQUIPMENT Oxyacetylene

Air Reduction Sales Co., 60 E. 42nd St., New York, N. Y.
Linde Air Products Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

WELDING AND CUTTING GAGES

Air Reduction Sales Co., 60 E. 42nd St., New York, N. Y.
Linde Air Products Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

WELDING EQUIPMENT, Electric Arc

Air Reduction Sales Co., 60 E. 42nd St., New York, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Expert Welding Machine Co., 17144 Mt. Elliott Ave., Detroit 12, Mich.
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

WELDING EQUIPMENT, Electric, Spot, Butt, Seam, Etc.

American Electric Fusion Corp., 2606 Diversey Ave., W., Chicago, Ill.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Expert Welding Machine Co., 17144 Mt. Elliott Ave., Detroit 12, Mich.

WELDING POSITIONER

duMont Corp., Greenfield, Mass.
Johnson Machine Works, 617 Menomonie St., Eau Claire, Wis.

WELDMENTS

Mahon, R. C., Co., Detroit 34, Mich.
Mathewson Machine Works, 28 Hancock St., Quincy 71, Mass.
Woods, A. C., & Co., Div. Kropp Forge Co., 1129 Harrison Ave., Rockford, Ill.

WIRE

American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

WIRE FORMING MACHINERY

Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

WIRE NAIL MACHINERY

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
National Mchry. Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

WOODWORKING MACHINERY

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

WORM DRIVES

Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

WRENCHES

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Cleco Div., Reed Roller Bit Co., (Impact, Pneumatic), 5125 Clinton Ave., Houston 20, Tex.
Ingersoll-Rand Co. (Impact, Pneumatic, Electric), Phillipsburg, N. J.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

WRENCHES, Detachable Socket

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

WRENCHES, Pipe

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Peck, Stow & Wilcox Co, Southington, Conn.

WRENCHES, Ratchet

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

WRENCHES, Tap

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

WRENCHES, Torque Measuring

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Sturtevant, P. A., Co., Addison, Ill.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

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With every size in SKF's wide range of ball and roller bearings, you receive an extra quality—*team-work*. This is the ability of SKF field and home office engineers to cooperate productively with your equipment designers. Helping to solve their bearing problems is the *extra* which all industries have learned to expect from SKF.

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When the Decision's High Precision

Use these TAFT-PEIRCE Machines to—

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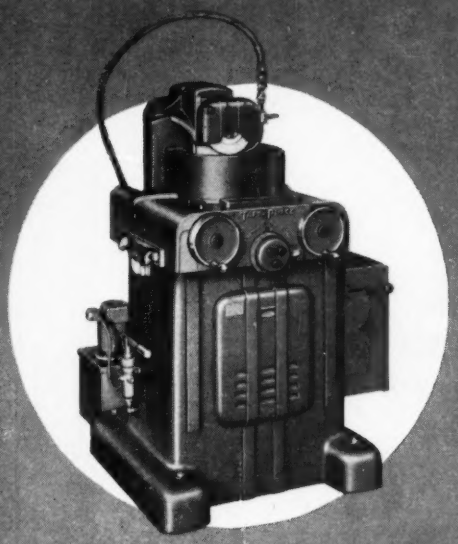
T-P #1 Surface Grinder.

Grinds surfaces to an accuracy, flatness, and finish formerly considered difficult or impossible. Full ball bearing construction provides extreme precision with almost effortless operation. Vernier attachments make horizontal and vertical settings to 0.0001". Tilting Wheelhead speeds and simplifies setups.



Reduce Grinding Time

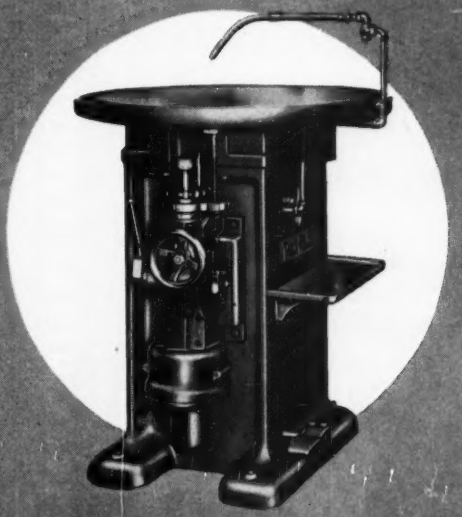
T-P 6″ Rotary Surface Grinder.

Developed for our own shops to provide high precision easier and faster than ever before. Tilting Wheelhead tips 30 degrees below wheel center . . . locks accurately in any position. Superpower magnetic chuck turns through 15 degree angle. Vernier feed permits .0001″ vertical settings.

Lower Lapping Costs

T-P 24″ Rotary Lapping Machine.

Offers a fast, accurate way to obtain superfine finishes and true contact surfaces. Low in original cost, economical to operate, it has the speed and capacity for rapid processing in small lot manufacture or tool room work. Available with plain plate for cylindrical work, grooved plate for flat work.



Eliminate Complex Tooling

T-P Back Spot Facing Machine.

Simplifies counterboring or backfacing bosses that are hard to get at. Circular 31½″ work table has hole which allows shank of inverted counterbore to project through table. Groove in table collects coolant. Cutter speeds 170 to 300 rpm.; ½ HP motor.

For the complete story on these items and many more, get your copy of the New Taft-Peirce Handbook.

T-P means Top Precision

THE TAFT-PEIRCE MANUFACTURING COMPANY • WOONSOCKET, RHODE ISLAND

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TUNGSTEN-CARBIDE

WESSON TOOL HOLDERS

First . . TO TURN CRANKSHAFTS

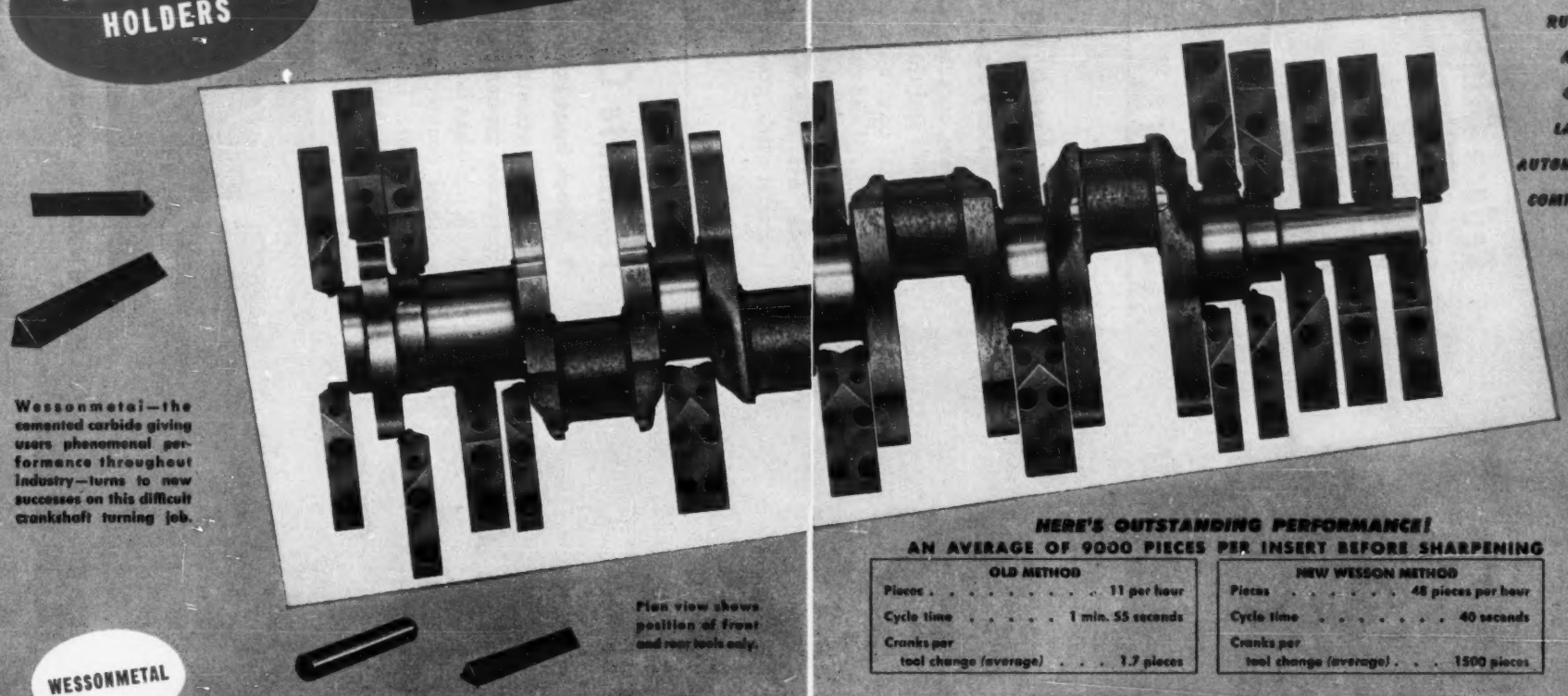
with CARBIDE INSERT TYPE TOOLS

USING WESSON BAND TYPE TOOL HOLDERS

and WESSONMETAL SOLID CARBIDE INSERTS

ON LoBLOND AND WICKES LATHES

NOW RUNNING AT ONE OF THE LARGEST AUTOMOTIVE COMPANIES



Wessonmetal—the cemented carbide giving users phenomenal performance throughout industry—turns to new successes on this difficult crankshaft turning job.

Plan view shows position of front and rear tools only.

HERE'S OUTSTANDING PERFORMANCE!

AN AVERAGE OF 9000 PIECES PER INSERT BEFORE SHARPENING

OLD METHOD	
Pieces	11 per hour
Cycle time	1 min. 55 seconds
Cranks per tool change (average)	1.7 pieces

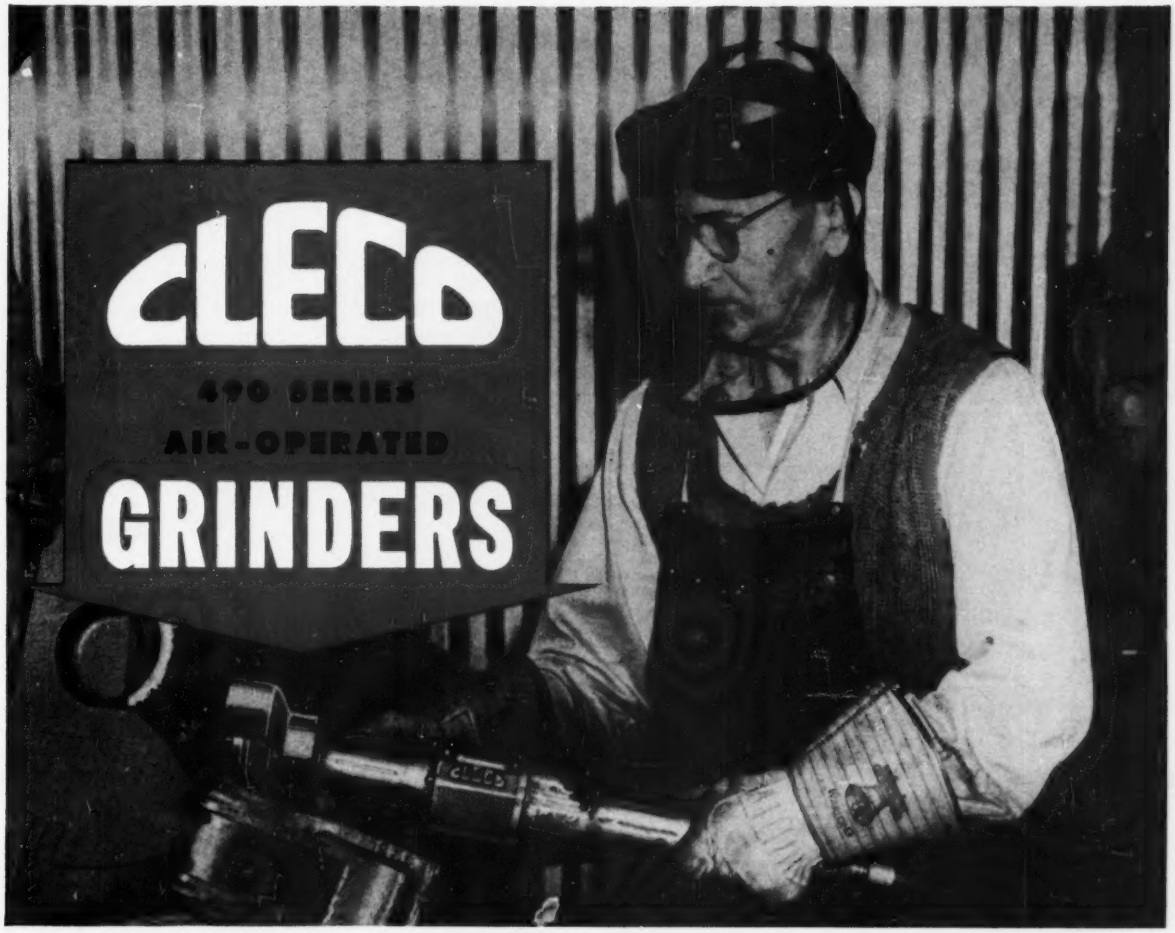
NEW WESSON METHOD	
Pieces	48 pieces per hour
Cycle time	40 seconds
Cranks per tool change (average)	1500 pieces

WESSONMETAL

WESSON METAL CORPORATION
LEXINGTON 34, KENTUCKY

WESSON COMPANY
1220 WOODWARD HEIGHTS BLVD. • FERNDALE (DETROIT 20), MICH.

WRITE FOR *Complete Story* with DRAWINGS



Fast grinder for Mn.-Mo. steel castings

Cleco 490 Series Grinders do a fast, economical job of cleaning up hard castings like these of manganese-molybdenum alloy steel. They cut fast—reducing cleanup time—and they stay on the job with a minimum of maintenance.

Don't waste time and money trying to use the wrong grinder when you can cut costs and increase output just by selecting the right tool.

Go over your grinding problems with a Cleco Field Engineer. Let him help you select the right grinder for each application. Ask him to suggest ways to get the most out of each tool. You will be surprised at the savings you can make.

CLECO AIR TOOLS

CLECO DIVISION

of the REED ROLLER BIT COMPANY, 5125 Clinton Drive, Houston 20, Texas, U.S.A.

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PENNSYLVANIA: Philadelphia 20, 5220 N. Fifth St. . . . Pittsburgh, Room 621, Highland Bldg.

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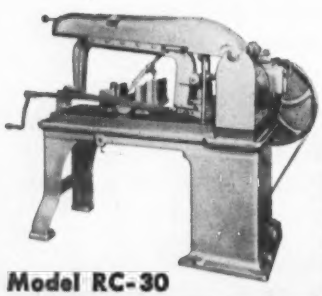
MODEL RC-250

Swedish Craftsmanship!

CUTTING ECONOMY ... with SAJO Hydraulic Hacksaws

NO PRIORITY
PROMPT DELIVERIES
ATTRACTIVE PRICES

Another Swedish contribution to lower manufacturing costs! SAJO Power Hacksaws, produced by Sweden's largest Hacksaw manufacturer, are available in three models — all Hydraulic — designed to meet the needs of the small, medium or large metal-working plants. Operation is simple and foolproof. Modern design, sturdy construction and painstaking workmanship put SAJO on a par with the finest in hacksaws. Their modest cost represents an outstanding value in this type of metal cutting equipment.



Model RC-30

Write for literature and prices on:
Light Duty Model RC-30, 6" x 6" capacity
Medium Duty Model RC-45, 9" x 9" capacity
Heavy Duty Model RC-250, 10" x 10" capacity

Each machine carrying the Austin seal is sold with the manufacturer's full guarantee and our positive assurance of user's satisfaction. Replacement parts — in stock.

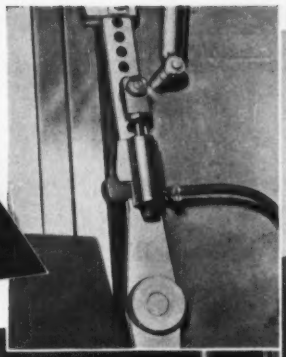
Compare carefully. You'll choose SAJO!

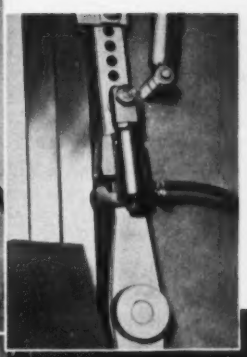
AUSTIN INDUSTRIAL CORP. 76-E MAMARONECK AVE. WHITE PLAINS, N. Y.

DEALERS IN PRINCIPAL CITIES

CECO-DROP SHORT STROKE CONTROL

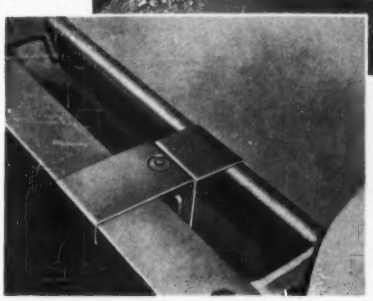
"Makes the Hammer Talk!"





An installation of a Short Stroke Control on a 2500 lb. CHAMBERSBURG CECO-DROP HAMMER is shown, forging steel ankle joints for leg braces. Above are samples of the forging as it appears during various stages. The forging process begins with a series of 20 to 23 short, rapid blows (about 18" stroke) to draw the 2½" dia. stock. This is followed by two long blows (about 35" stroke) to roll it, three more long blows in the rough impression, and three more long blows to complete the forging. After the last blow the ram is stopped on the up-stroke at the "short blow" position for the next forging.

Short Stroke Control is but one of the many features of Chambersburg CECO-DROPS. These piston lift, gravity drop hammers are setting new standards in forge shop production. Lower operating costs, minimum down time, easy operation, wide range of operations, extra safety; all add up to "more forging per hour" the basis on which to judge the efficiency of a Drop Hammer. Write for Bulletin 11-L-0.



(Above right) Dog in full stroke Position. Wedge is lifted, Short Stroke Control is inoperative.

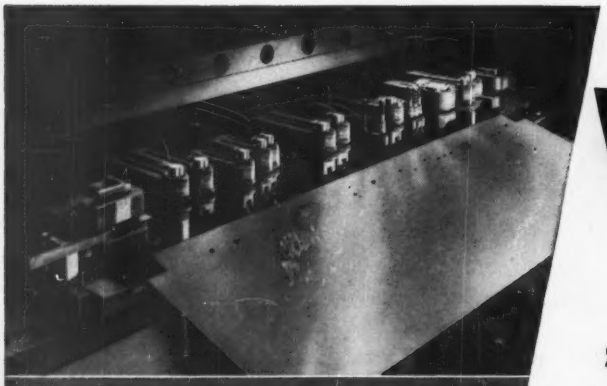
(Above left) Dog in Short Stroke Position. Wedge is down, holding dog in operating position.

(Lower left) Button on treadle when depressed by operator shortens the stroke. Release reverts to full stroke.

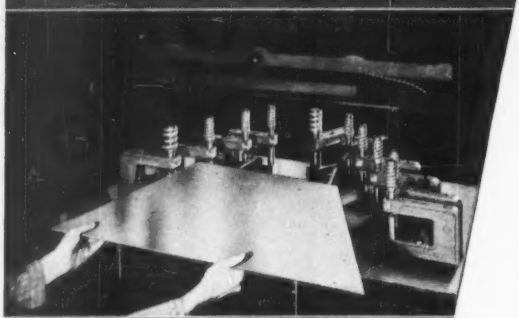
CHAMBERSBURG ENGINEERING COMPANY, CHAMBERSBURG, PA.

CHAMBERSBURG

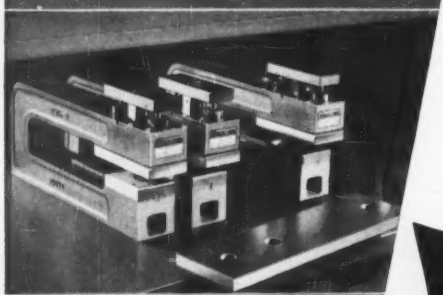
THE HAMMER BUILDERS



Showing Wales Type "BL" Hole Punching and Type "N" Notching Units in a combination press brake setup for punching and notching mild steel up to 1/8" THICK.



A stamping press setup of Wales Type "CJ" Hole Punching Units for punching mild steel up to 1/4" THICK.



Showing a setup of Wales Type "HS" Hole Punching Units in a press brake for punching mild steel up to 3/4" THICK.

Showing a setup of Wales Type "NJ" Notching Units in a stamping press for notching mild steel up to 1/4" THICK.

PUNCHING 1/8", 1/4" AND 3/4" THICK METAL?

standardize on WALES Hole Punching Units

Only Wales Hole Punching and Notching Units provide the numerous *patented features* plus the *time and cost saving advantages* that have made it "standard practice" with thousands of metal fabricators to *standardize* on this *exclusive* equipment.

Wales independent, self-contained Units eliminate costly, single-purpose custom dies, reduce expensive setup time and practically eliminate press "downtime."

The same group of Wales Units may be interchangeably set up in stamping presses and press brakes. In many cases, setups of Wales Units are in production the same day a hole punching pattern is released by your engineering department.

The multiple advantages of Wales Hole Punching and Notching Equipment are too MANY to tell here, so write for fully-illustrated, functionally colored catalogs TODAY.

WALES-STRIPPIT CORPORATION

George F. Wales, *Chairman*

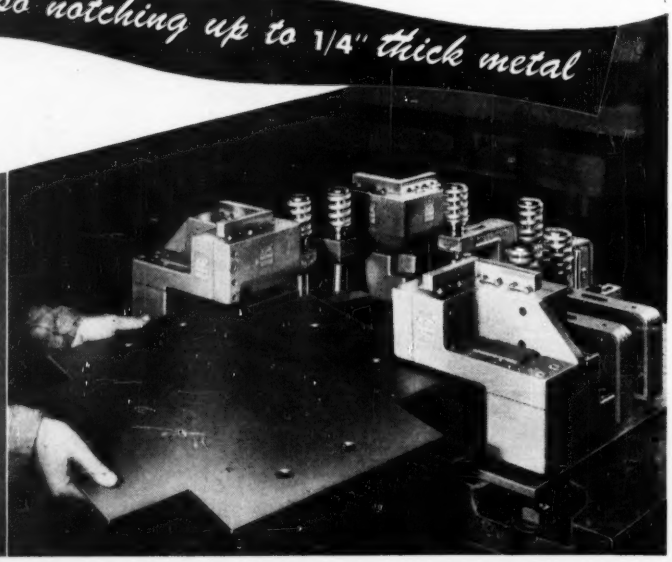
375 **Payne Avenue, North Tonawanda, N. Y.**

(Between Buffalo and Niagara Falls)

Wales-Strippit of Canada, Ltd., Hamilton, Ontario

Specialists in Punching and Notching Equipment

also notching up to 1/4" thick metal



"Here's a swell welder's glove, Joe!"

Yes, it's

AO HEAVY DUTY HORSEHIDE

Best for Flexibility, Heat Resistance, Wear

"Shake hands" with AO's "super" line of hand protection for welders. Each glove and mitten is 14" long . . . has a smooth finish . . . improved heavy weight soft lining on back for greater protection . . . quality edges bound with tape and stitched. These are features which make this chrome-tanned *horsehide* line better than ever. Test them on the job. *See* the difference! *Feel* the difference! Your nearest AO Safety Products Representative can supply you.

TX100 Gunn cut—one piece back. Double thickness of leather on first finger and thumb, also on portion of palm. Lined on back from wrist to finger-tips.

5X163 Gives exceptional resistance to heat on gas welding and heaviest amperage electric welding. One-piece back and palm. Welted at all vulnerable seams. Extra heavy lining on back of hand.

TX200 Gunn style. Standard size (11) also sizes 10, 12. Welted seam at base of palm and wrist. One-piece back. Wing thumb.

6X141 One-piece back and palm. Crotch of thumb reinforced with wide leather strap. All vulnerable seams welted for extra protection. Back of hand is lined.

Also ask to see and feel the other six gloves and mittens in this top quality AO line.

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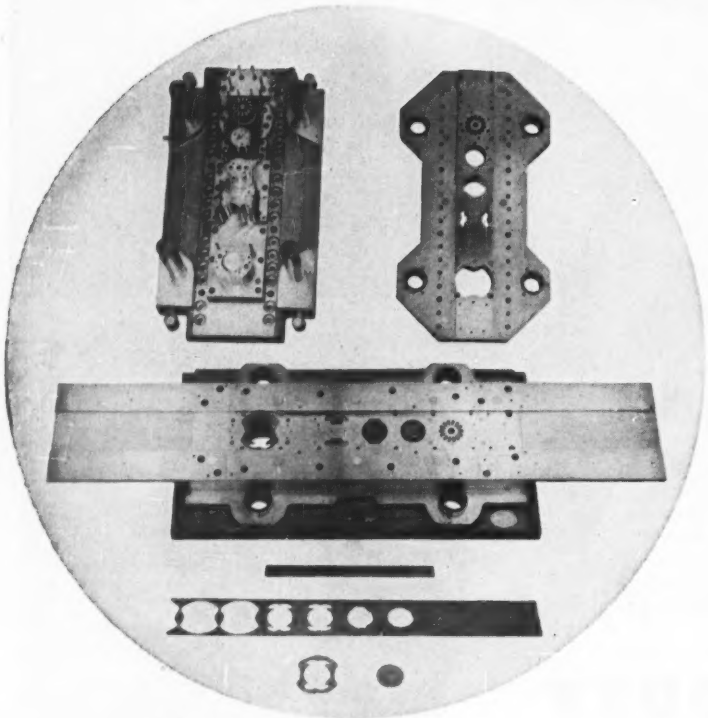
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

This die was not just "made"...

it was ENGINEERED



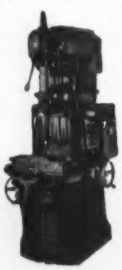
Just a choice of words, you say? No, it's more than that. The progressive steel lamination die shown here was hole-bored, hole-ground and contour-ground to pre-engineered dimensions entirely on Moore-built machines in the Moore toolroom. It exemplifies the application of *engineering* principles that put die-making on an interchangeable parts-and-assembly basis for the first time.

Let's take a close look at this die: All die sections are mounted in a hardened nickel-chrome frame for maximum production and die life; the die set was specially made by Moore. The spring stripper is guided on four main posts. High-speed inserts are set into hardened steel frames.

Moore produced all parts of the die *to figures instead of to "fit."* This was done concurrently by several toolmakers instead of progressively as a slow, one-man job.

Precision Hole Location and Contour Grinding Methods Assure Accuracy, Speed, Economy

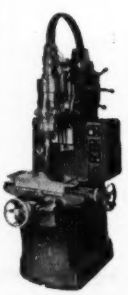
THE NO. 2 MOORE JIG BORER bored all holes before hardening, thus holding the location as close as possible to eliminate excessive grinding. With its built-in system of accurate lead screws, the Moore Jig Borer can spot, drill, bore or ream all holes in a workpiece with minimum tool changes and to close tolerances.



No. 2 MOORE JIG BORER

Punches and dies of the first station—at the right in the photograph—were ground with a *Moore Panto-Crush Wheel Dresser*. This machine, which combines roll-crushing and diamond dressing, did the required linear contour grinding quickly and efficiently. *Moore Motorized Centers* handled several of the smaller grinding jobs.

WITH THE NO. 2 MOORE JIG GRINDER, all die sections were screwed and doweled into place, put on the machine and ground in *one* set-up. This eliminated separate section hole-grinding and the accompanying difficulty of accurately locating each section in the die bed. The Jig Grinder does the job in one-third the time required by previous methods.



No. 2 MOORE JIG GRINDER

To grind Stations 2, 3, 4, 5 and 6, the new contour-grinding and slot-grinding features of the Jig Grinder were utilized.

Die try-out and assembly operations were performed the modern, fast, "mechanized" way on the *Moore Die Flipper*.

End results? Moore equipment brings true interchangeability to the toolroom, lowers tool costs, increases toolroom capacity, prolongs die life and achieves greater accuracy.

Detailed bulletins on these machines are yours for the asking—today. Write to: Moore Special Tool Company, Inc., 734 Union Avenue, Bridgeport 7, Conn.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS
DIE FLIPPERS • MOTORIZED CENTERS • HOLE LOCATION ACCESSORIES

This is another of the "HUNDREDS OF JOBS" which can be done only on a MARVEL Band Saw!

MARVEL BAND SAW saved these two 4400 lb. castings

Two sand cores washed out when these giant 4400 pound steel connecting rods were cast, resulting in solid eye ends without gaps. Then came the $64 question—how to machine out the 1½" slots in the longitudinal center of the eyes which were 22" high and had a wall thickness of 6½".

The Ernest J. Nelson Iron Works of San Francisco, did this "impossible" job easily, quickly and economically, without special tooling, on a standard Model No. 8M/2 MARVEL Band Saw. Two cuts were made in each rod in two hours per cut with tool cost of $3.06 per rod. The tool was a MARVEL B9-10 Band Saw Blade.

Every tool room, machine shop and maintenance department needs a MARVEL Series 8 Universal Band Saw—not only for innumerable everyday jobs but for the occasional "trick" operations, where its utmost versatility will save many headaches and dollars.

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MARVEL Metal Cutting SAWS
Better Machines–Better Blades

These exclusive MARVEL Features made this job easy.

1. Large, T-slotted work-table.
2. Blade feeds into work vertically; work always stationary.
3. Power-pressure feed.
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see our CATALOG in SWEET'S FILE

INVESTIGATE!

and use the LAPMASTER...

Above, parts lapped at high production on Lapmaster. Left, Model 12 Lapmaster in operation. Other machines available in complete range of sizes.

If You Want PRECISION FLATNESS, FINISH and PARALLELITY in PRODUCTION QUANTITIES

A manufacturer of hardened high carbon steel valves required parts lapped to a degree of flatness for withstanding 2000 P. S. I. air pressure with no leakage. The part shown above is $\frac{3}{8}$" in diameter and $\frac{1}{16}$" thick. It is precision lapped on each side with the Lapmaster 12" at the rate of 195 pieces per 5 minute lapping cycle per side.

Prior to his investigation of the Lapmaster, the manufacturer had not been able to find a satisfactory method of lapping these valve parts. He reported that he would have been unable to make this valve to its existing design without the Lapmaster. The economies of production it afforded made it possible for him to produce the valve at a marketable cost.

Use this FREE Laboratory Service to determine Your Exact Needs . . .

In order to determine whether lapping would be practical and profitable for you, we maintain a laboratory for lapping sample parts. If you believe it may offer possibilities in your plant we invite you to send prints of the parts, together with surface finish requirements and production desired. In addition send several parts for test lapping in our laboratories. We can then give you the facts on what you can expect from the Lapmaster. There is no obligation for this service.

ADDITIONAL DATA...

on the complete line of Lapmasters is available on request. Write for your copy today. Ask for bulletin. M-2.

Consistent Flatness of 1 Light Band Opens Possibilities for Product Improvement

Manufacturers of pumps, compressors, and equipment containing liquids or air under high pressures have found it possible to eliminate gaskets in mating surfaces because of the extreme accuracy of work produced by the Lapmaster. Quality of surface (RMS) is controlled by Lapmaster compounds. Micro-inch finishes of 2 to 3 RMS are common. Surface flatness can also be held to less than one light band or .0000116". (11.6 millionths of an inch.)

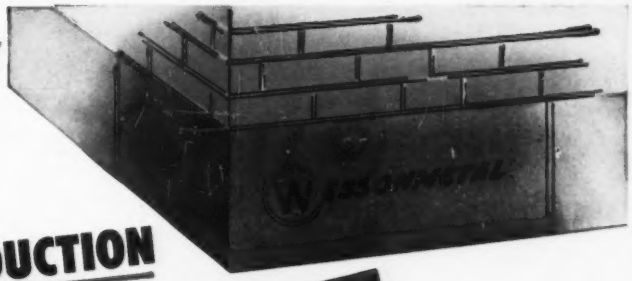
JOHN CRANE

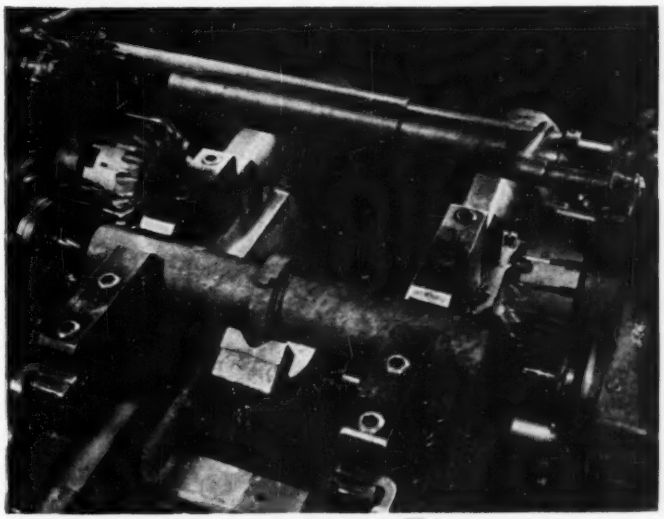
PACKINGS | MECHANICAL SEALS | TEFLON PRODUCTS | LAPMASTER LAPPING MACHINE | PIPE SEALING COMPOUNDS

CRANE PACKING COMPANY 1833 CUYLER AVENUE CHICAGO 13, ILLINOIS

WESSONMETAL

CORNERSTONE for METAL WORKING PRODUCTION





150% INCREASE IN OUTPUT PER DOLLAR SPENT FOR *WESSON TOOLING*

COMPLETE PRODUCTION STORY ON THE CATERPILLAR TRACK ROLLER SHAFT

Machine.....Fay automatic lathe
Part Machined...Track roller shaft
Operation.....Milling and centering
Material.....1046 steel
Tools.....6¾" dia. Wesson Rigidcut Milling Cutter—18 blades
Speed.....320 S.F.M.
Depth of Cut.....¼" to 7/16"
Feed.....15" per min.
Feed per Tooth.....005"
Feed on Center Drill.....006"
Production.....400 pcs. per grind; 50 pcs. per hour
Grade of Carbide..Wessonmetal WH

OLD METHOD	WESSON ENGINEERED METHOD
Pieces Per Grind.....166	Pieces Per Grind.....400
Tool Cost Per Piece...$0.0716	Tool Cost Per Piece..$0.0285
Grinding Hours Per Year.....420	Grinding Hours Per Year.....183.33

ON 1 JOB WITH 1 WESSON TOOL SAVINGS OF OVER $2400.00 PER YEAR

WESSON METAL CORPORATION
LEXINGTON, KENTUCKY
Affiliated with WESSON COMPANY, Detroit, Mich.

WESSONMETAL Cemented Carbide

what are your DELIVERY requirements FOR hydraulic pumps?

If you need **PROMPT** delivery to expedite production...

If you need **PUMP** delivery from .4 to 40 gallons per minute . . . at operating pressures up to 1000 p.s.i. (in some sizes, 1200 p.s.i. continuous, 1500 p.s.i. intermittent) . . . with the smoother, more uniform flow produced by the highly efficient Gerotor mechanism . . .

specify GEROTOR hydraulic pumps

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ONE QUICK TWIST

and ..... you're ready to drill with an

Ettco-Emrick
KEYLESS DRILL CHUCK

• The Ettco-Emrick Keyless Drill Chuck is the nearest thing to completely automatic chucking there is. It's self-tightening and self-centering. All you do is insert the drill between the jaws and give the knurled chuck body a turn. Drilling action does the rest, clamping the jaws on the drill in a powerful, rigid grip that automatically increases with the load. No key is needed. Slipping, retightening and scored shanks are eliminated. There's no better drill chuck buy today.

Contact us for details and prices. Sizes from 0 to ⅜" drills.

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Columbus Die-Tool

Get production off to a profitable start! Use Columbus Die-Tool engineered tools. Jigs, Fixtures, and Special Machinery individually designed and built to produce your product alone . . . at a rate to match your production schedule. That's production economy! That's the wisdom of CDT special machinery! That's how Columbus Die-Tool can put your production on a profitable basis. Columbus Die-Tool are specialists in building special tools, jigs, fixtures and machinery . . . have been for over 46 years. Talk over your special problems with us. Absolutely no obligation. Write today.

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AND MACHINE COMPANY
P. O. BOX 750 • COLUMBUS, OHIO
ESTABLISHED 1906

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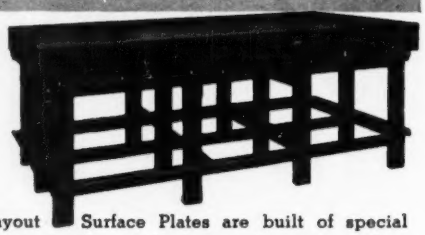
SPECIAL TOOLS • UNITS FOR MACHINE TOOLS

CHALLENGE

Challenge offers a broad line of precision surface plates for layout, inspection, checking, lapping, assembly and welding. Note the features of those illustrated and described below—and send for the Challenge catalog for full details on the complete line.

LAYOUT SURFACE PLATES

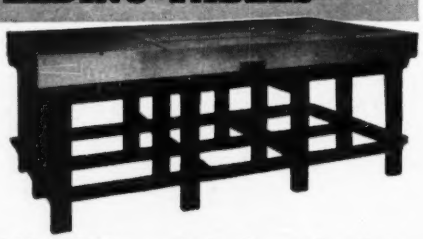


Challenge Layout Surface Plates are built of special analysis semi-steel with a perfectly smooth, square surface for layout, inspection or assembly work. Sizes range from 12"x18" to 54"x144". All-steel stand is arc-welded for rigidity. Leveling screws assure perfectly level surface. Special surface plates are available on order.

LAPPING PLATES

Challenge Lapping Plates are designed for precision lapping of delicate joints on which no sealer is used. Ideal for crank cases, cylinder heads, gear housings and other parts which must be lapped perfectly to avoid oil leaks. Plates have ⅛" grooves, ½" apart, running the full length and width of the surface.

WELDING TABLES



Challenge Welding Tables are built of special analysis semi-steel to provide a smooth, accurate surface with "Tee-Slots" for assembling, locating and welding. They are available in three standard sizes; 30"x60", 48"x96" and 54"x144"; other sizes to order. A sturdy all-steel stand with leveling screws is included with table.

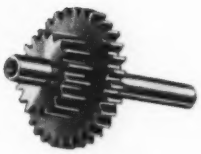
Write for complete details today. 729

The Challenge Machinery Co.

Office, Factories and Show Room: GRAND HAVEN, MICHIGAN

Challenge TRADE-MARK ®

Keep free of costly assembly headaches with small gears by..



Assembly lines run smoother, with greater speed and efficiency, when your Small Gearing is made by G.S. It is consistent *uniformity* that turns the trick! Over 35 years of specialization has taught us to mass-produce Fractional Horsepower Gearing to standards of quality often considered impossible! If you want production quantities of Small Gears that soothe assembly headaches, *let G.S. make them for you!* More and more critical buyers are profiting by the superior skills and services only G.S. can give. Call us early when new designs are considered. We'll try to point the way toward new production speed and economies.

GET OUR *Free* 6-PAGE FOLDER

See where and how we mass manufacture Small Gearing to uniformly fine tolerances. This attractively printed 8½ x 11" 6-page folder is punched for ring-binder use. You'll want to keep it handy for frequent reference. It contains 23 pictures of Small Gears, plant views, as well as Diametral and Circular Pitch Tables. Ask for your copy on company stationery, please!

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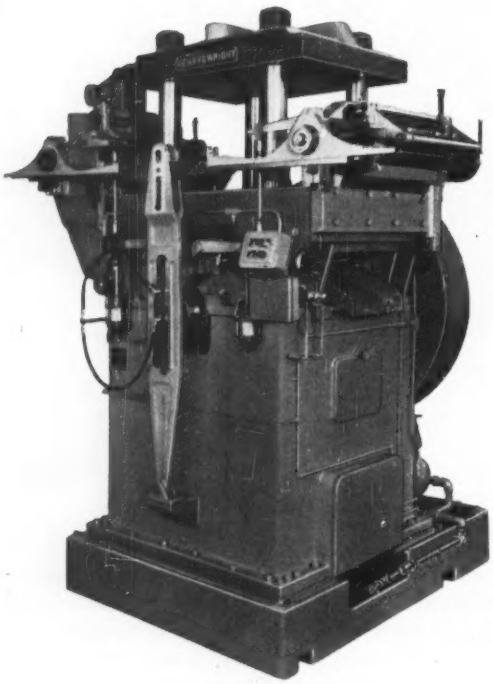
WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS

A PROFIT WITH EVERY STROKE



Our customers say that. It figures. One Dieing Machine does the work of five to ten conventional stamping presses. One stroke—a complete part. One inspection. One trip for parts removal. Speed—you can pull out the throttle. Die life—longer for two reasons. (1) Stability, minimum vibration, extreme precision of tools alignment. (2) Dies take less of a beating; less metal needs to be removed for sharpening. Our men can give you the whole Dieing Machine story. If you want to cut costs, now's the time to talk to one of them—a note from you will have an H & W man on deck promptly.

NEW CATALOG Up-to-the-minute facts on Dieing Machines. Capacities now range from 25 tons to 2500 tons. Catalog gives specifications up to 400-ton machine. Write Henry & Wright, 461 Windsor St., Hartford, Connecticut.

HENRY & WRIGHT

DIVISION OF EMHART MFG. CO.

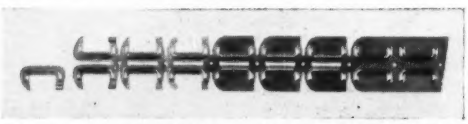
HARTFORD 1, CONNECTICUT

TYPICAL JOBS THAT SHOW A PROFIT AT EVERY STROKE

Automotive stamping produced complete per stroke from 5/32" thick by 13" wide hot rolled steel in coils on 200-ton Dieing Machine, single gear type, equipped with progressive die. Speed approximately 45 strokes per minute.

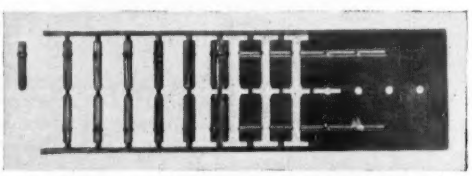
Ball bearing retainer produced complete in 75-ton Dieing Machine operating at speed of 95 strokes per minute. Made from 4⅜" wide by .034" thick cold rolled steel.

Ferrule. One completed piece produced per stroke in 50-ton Dieing Machine operating at speed of 90 strokes per minute. Made from 9/16" diameter by ⅜" long by .030" thick cold rolled steel.

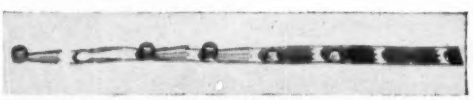


C-Clamp Frame. Both halves produced complete in 150-ton Dieing Machine operating at speed of 65 strokes per minute. Material—cold rolled steel .086" by 4⅜" wide.

Support bracket produced complete one per stroke in 150-ton Dieing Machine operating at speed of 60 strokes per minute. Made from .062" thick by 7¼" wide cold rolled steel.



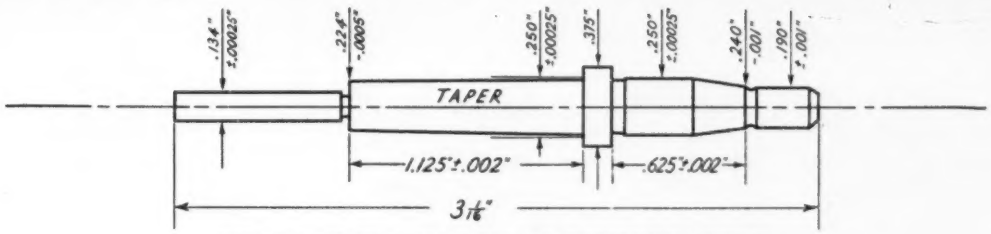
Radio tube prong produced complete in 25-ton Dieing Machine at rate of 450 pieces per minute. Made from brass .012" by 1 7/16" wide.



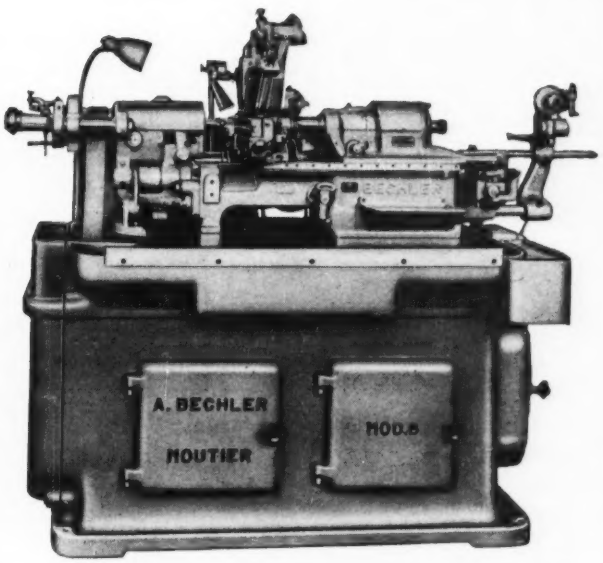
Bathroom fixture produced in 60-ton Dieing Machine operating at speed of 100 strokes per minute. Made from .032" thick by 1¾" wide cold rolled steel.

Hardware item. One completed piece produced per stroke in 100-ton Dieing Machine operating at speed of 75 strokes per minute. Made from 3" wide by .040" thick cold rolled steel.

It's a Natural for BECHLER AUTOMATICS



SHAFT MADE OF 416 STAINLESS STEEL



Model B-20 BECHLER AUTOMATIC has ¾" diameter capacity, 3" turning length with flat cams, 5¾" with bell cams, 5 cross slides and combined centering—drilling—threading (tapping) attachment.

When parts are too long or slender and tolerances too tight to produce on regular screw machines, BECHLER SWISS AUTOMATICS will do the job *Quickly, Accurately and with exceptionally high surface finishes.*

Send us prints of your parts, our Engineers will recommend the machine and tooling best suited for the job.

DIAMETER CAPACITIES

BECHLER AUTOMATICS

Model AS	5/64"	5/32"	9/32"	3/8"
Model A	—	5/32"	9/32"	3/8"
Model B	1/2"	5/8"	3/4"	—
Model C	1"	1¼"	—	—

BECHLER ISOMATICS

Automatics for constant and highly accurate production of very small parts.

Model AS	5/64"	5/32"	9/32"
Model A	—	5/32"	9/32"

OTHER BECHLER MACHINES . . . MODEL CF CAM SHAPERS • SIMPLEX AND DUPLEX PINION CUTTING MACHINES

ADDITIONAL SERVICES

- **ATTACHMENTS, SPARE PARTS, CAMS available from New York Stock**
- **TOOLING SERVICES for planning layouts and set-ups and for making cams and tools**

SEE THESE MACHINES IN OPERATION AT COSA'S NEW YORK SHOW ROOM OR SEND FOR DESCRIPTIVE LITERATURE.

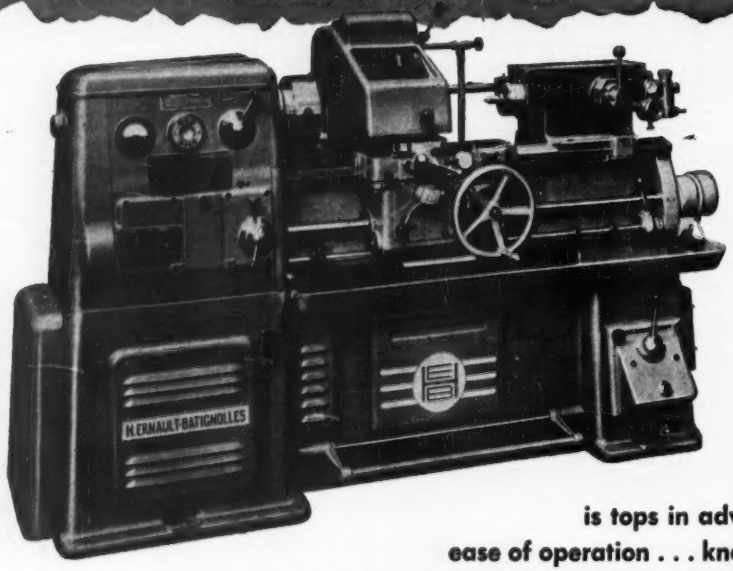
COSA CORPORATION

405 Lexington Ave., New York 17

Your source for all Precision Machine Tools—from Small Bench Lathes to Large Boring Mills

IN DETROIT AREA **contact DETROIT-COSA CORPORATION, 16923 James Couzens Highway, Detroit 35, Mich.**

Production tested and approved in over 1,000 plants



HIGH SPEED HYDRAULIC COPYING LATHE

Those who have *compared* copying lathes know the H.E.B. is tops in advanced design, construction and ease of operation . . . know that the H.E.B. means faster, trouble-free production with better finish, no distortion of the work.

The H.E.B. Copying Lathe has higher spindle speeds—up to 3600 RPM in the **OP Models** to take full advantage of carbide. **GT Models** with rotating pattern are designed for copying an infinite variety of irregular, non-circular work.

You won't find *chips* any problem at all. A sloping bed together with a built-in coolant pump result in automatic wash-away of the chips into a rear pan, from which they are easily removed *without stopping the machine.* Featured too are the power operated back tool posts which are part of the standard machine.

Remember, the H.E.B.'s patented copying device is an integral part of this ruggedly constructed lathe, resulting in rigidity and accuracy. Setting time is reduced to a handful of minutes, and finished parts are copy-turned up to 300% faster than on multi-tool lathes.

Designed and built in France by H. Ernault Batignolles—machine tool manufacturers for almost a hundred years!

If you are planning to make an investment in a copying lathe you want the best . . . Study our insert in Sweet's Machine Tool Catalog—Or write or phone us for detailed catalog or a demonstration!

TYPE 178 CONSTAN CARBIDE TOOL GRINDER

Specially designed for carbide tools without attachments. Heavily built, the Constan combines smooth operation and ease of setting with great rigidity. The inclinable table incorporates a ball and socket vise so that the tool may be clamped in any position. Two diamond wheels are mounted on the wheel head, and each may easily be brought into position.

H·E·B
"THE WAY TO TURN"

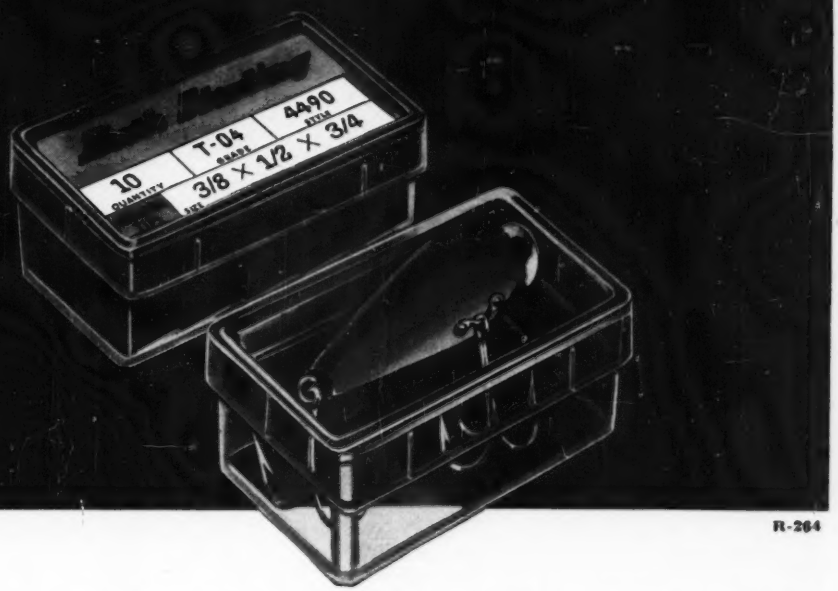
IMMEDIATE DELIVERY

H. E. B. MACHINE TOOLS, INC.
475 FIFTH AVENUE • NEW YORK 17, N. Y.
Telephone: LExington 2-0266

COPYING LATHES • ENGINE LATHES WITH COPYING ATTACHMENTS • TOOL ROOM LATHES • CARBIDE TOOL GRINDERS

what has a fishing plug to do

with FIRTHITE STANDARD TIPS



R-264

When a good fisherman buys a quality plug, it is usually contained in a plastic case so that he can easily store, identify, and protect the beauty. The same packaging technique has just been adopted by Firth Sterling, Inc. for its high quality Standard Carbide Tips. Now Firthite Tips are being delivered to you in plastic containers specifically designed for ease in handling, convenience in stocking, simplicity in identifying, and protection in storing.

FROM STOCK BINS TO YOU

This and other innovations in modern packaging are just a part of a new merchandising program by Firth Sterling which is centered on the creation of an entirely new Central Commodity Store Room for more efficient service to you.

High Speed Steels - Tool & Die Steels - Stainless Specialties - High Temperature Alloys - Sintered Tungsten Carbides - Chromium Carbides - High Temperature Cermets - Firth Heavy Metal

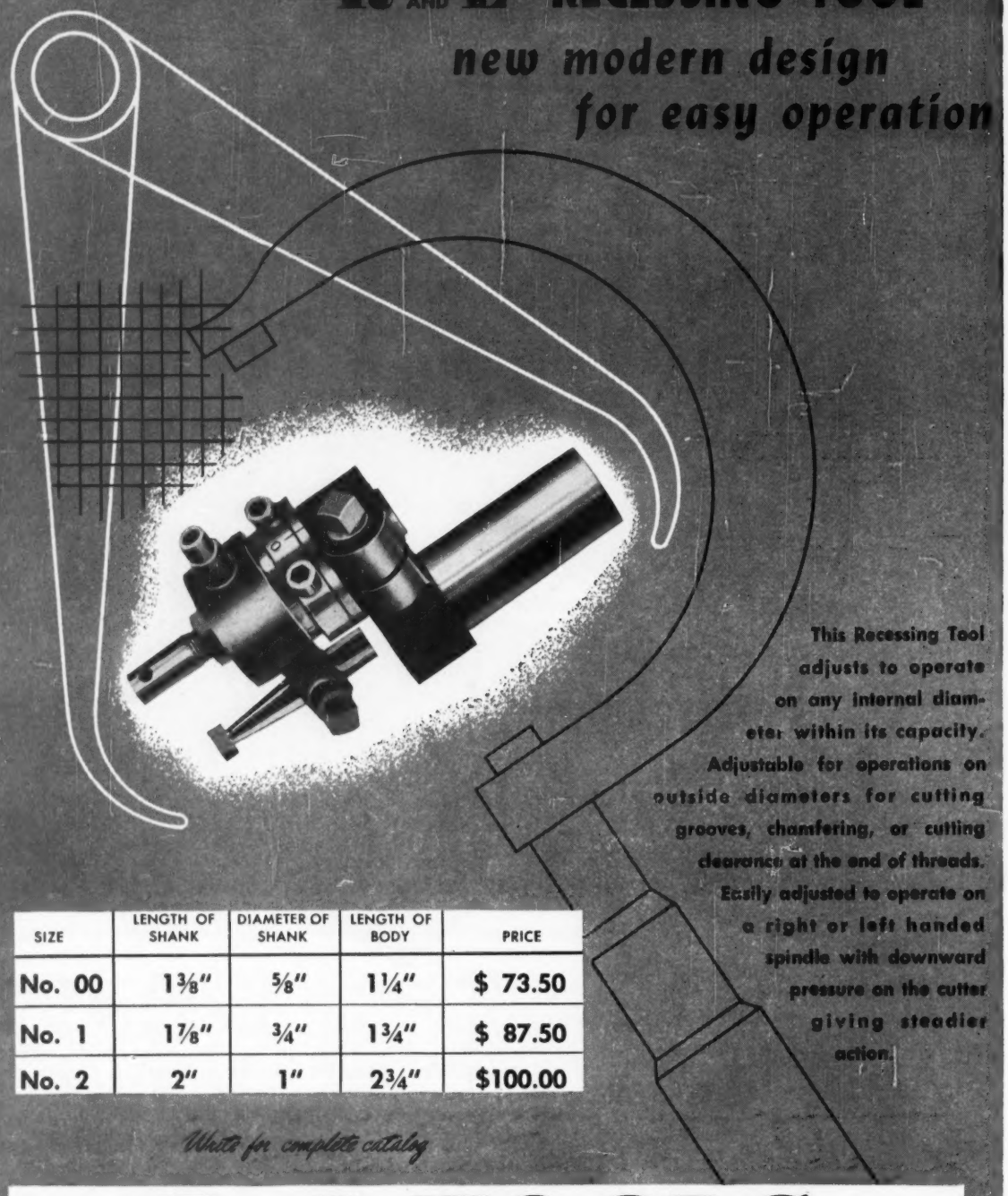
OFFICES* AND WAREHOUSES: HARTFORD NEW YORK* DETROIT CLEVELAND DAYTON* PITTSBURGH* CHICAGO BIRMINGHAM* LOS ANGELES PHILADELPHIA*

Firth Sterling INC

GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.

R AND L RECESSING TOOL

new modern design for easy operation



This Recessing Tool adjusts to operate on any internal diameter within its capacity. Adjustable for operations on outside diameters for cutting grooves, chamfering, or cutting clearance at the end of threads. Easily adjusted to operate on a right or left handed spindle with downward pressure on the cutter giving steadier action.

SIZE	LENGTH OF SHANK	DIAMETER OF SHANK	LENGTH OF BODY	PRICE
No. 00	1⅜"	⅝"	1¼"	$ 73.50
No. 1	1⅞"	¾"	1¾"	$ 87.50
No. 2	2"	1"	2¾"	$100.00

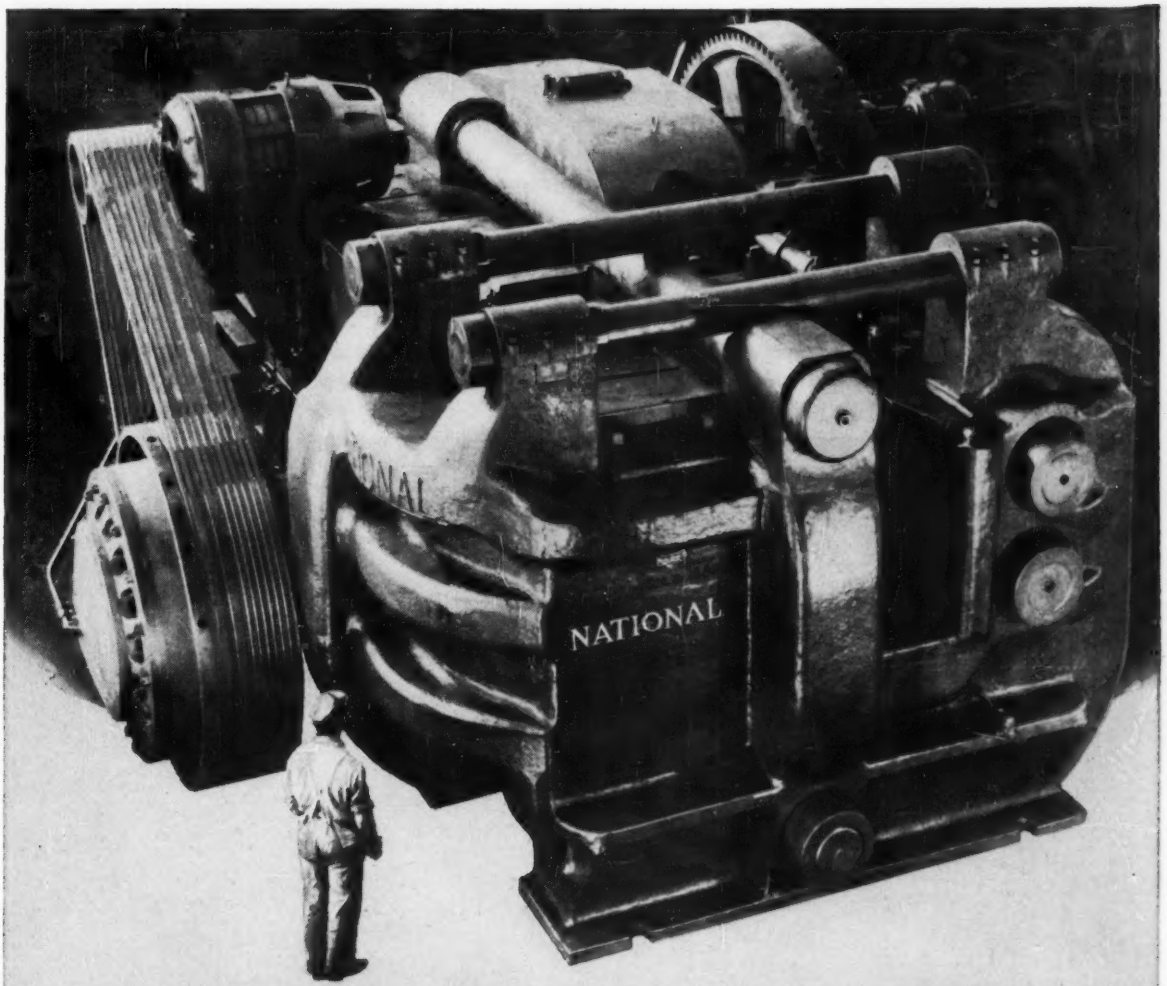
Write for complete catalog

RIGHT R and L LEFT TOOLS

1825 BRISTOL STREET • PHILADELPHIA 40, PA.

Manufacturers of Precision Screw Machine Tools

TURNING TOOL • TAP AND DIE HOLDER • UNIVERSAL TOOL POST • TURRET BACKREST HOLDER • CUT-OFF BLADE HOLDER • RECESSING TOOL RELEASING ACORN DIE HOLDER • REVOLVING STOCK STOP • FLOATING DRILL HOLDER • KNURLING TOOL • CARBIDE AND ROLLER BACKRESTS



FOR DEEP-PIERCING AND UPSETTING!

Built into National Forging Machines is the ability to take in stride difficult deep-pierce and upset-forging jobs,

Rigid, long-running National upsetters, coupled with National's long-established die engineering experience, result in (1) A superior more-accurate forging; and (2) Increased round-the-clock lower-cost production.

THIS DOOR IS ALWAYS OPEN

Forgemen *still* choose National Forging Machines for their difficult work, and *still* come through our Open Door for assistance with their forging problems.

NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO—SINCE 1874

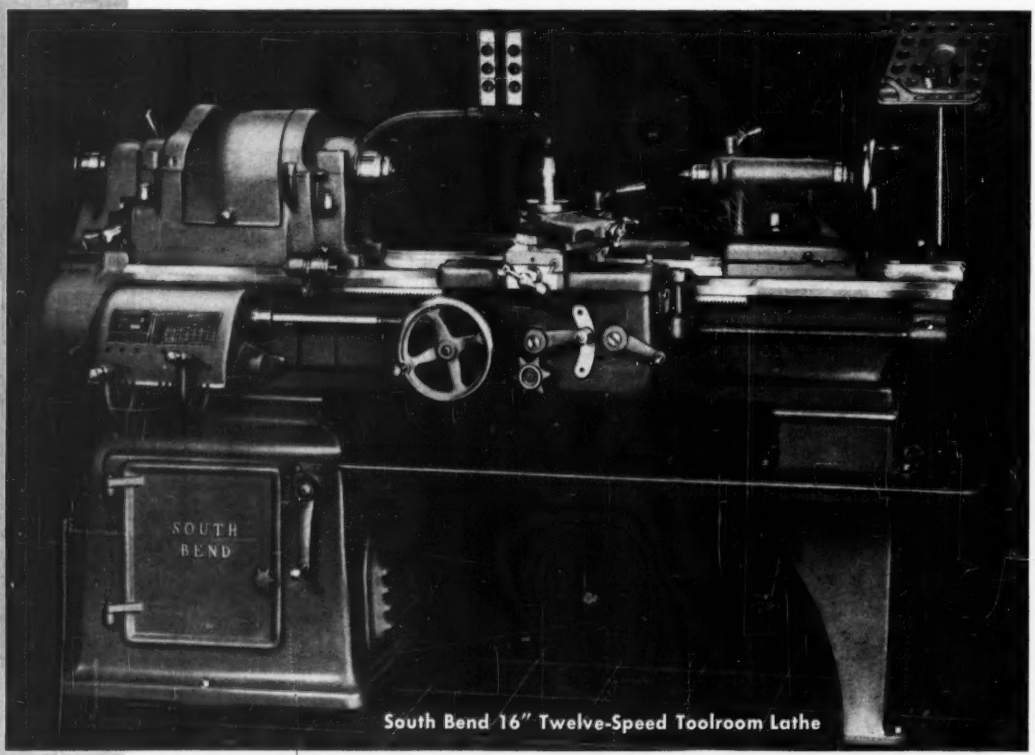
DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS • BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS

Hartford Detroit Chicago

Cuts Machining Time

SOUTH BEND 12 SPEED LATHE

The wide range of spindle speeds on this new lathe cuts machining time because the operator quickly selects the right speed for each operation. Pushbutton control provides a fast change from any high speed to the corresponding low speed. This versatility is further increased by 48 choices of longitudinal and cross feeds which insure maximum efficiency on every job. Also, you will find that its accuracy and ease of operation make your tough jobs easy. Send the coupon for complete information.



South Bend 16" Twelve-Speed Toolroom Lathe

SPECIFICATIONS

Spindle Speeds — 12. Direct drive: high range 300, 550, 945; low range 150, 278, 475. Back gear drive: high range 32, 70, 118; low range 20, 33, 60.

Spindle Bore — 1⅜".

Swing over bed and saddle wings — 16¼".

Swing over saddle cross slide — 9⅜".

Distance between centers — 33¼", 45¼", 57¼", 81¼", 105¼".

Collet Capacity — 1" maximum.

Longitudinal Feeds — 48 R.H. or L.H., .0015" to .0841".

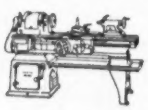
Cross Feeds — 48, .0006" to .0315".

Thread Pitches — 48, 4 to 224 per inch.

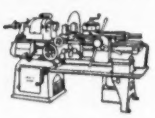
SEND INFORMATION CHECKED:

☐ _____

☐ 9" and 10" BENCH LATHES

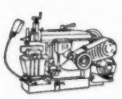


☐ 10" to 16-24" FLOOR LATHES



☐ ½" and 1" Collet TURRET LATHES

☐ 14" DRILL PRESSES



☐ 7" BENCH SHAPERS

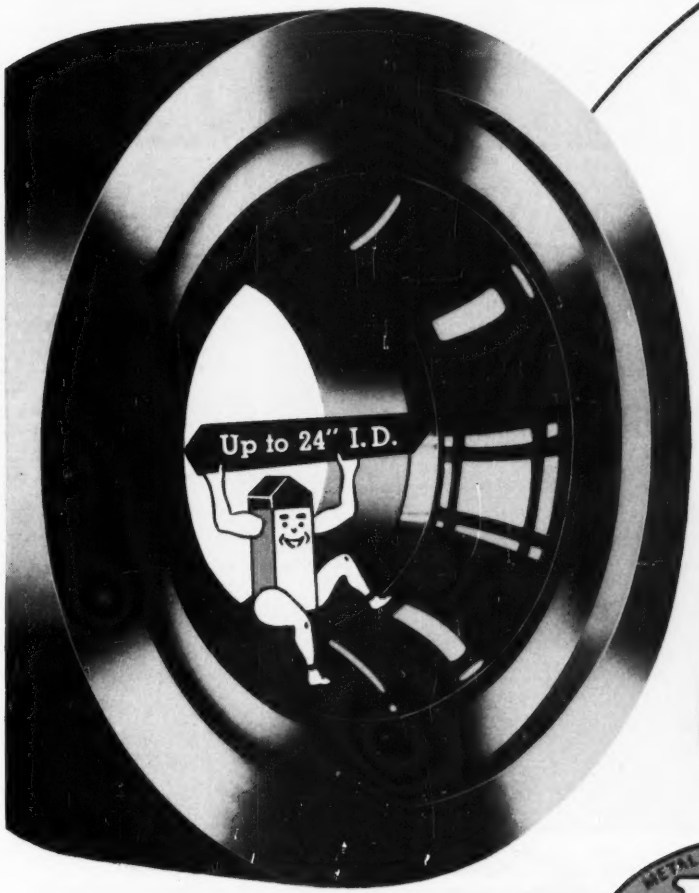
Name _____ Company _____

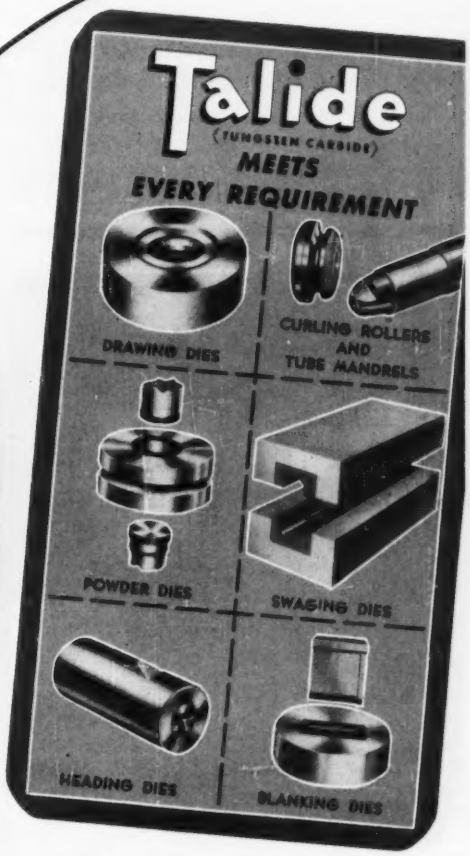
Street _____ City & State _____

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana

LONG, UNINTERRUPTED SERVICE WITH RUNS OF A MILLION PIECES OR MORE

TALIDE CARBIDE DIES outwear steel dies on most applications by at least 50 times. The 79 Rockwell "C" hardness (hardest steel 68 "C") of Talide Nibs assures long runs before redressing. The Alloy Steel Case, plus our special mounting process, is accurately calculated to withstand severest drawing pressures and increase both transverse and longitudinal nib strength. A diamond-lapped Micro-Inch Finish imparts a lustrous finish to drawn parts and minimizes pickup, scoring and scratching. 750,000 p.s.i. compressive strength and 95,000,000 p.s.i. modulus of elasticity (3 times steel) holds tolerances to .0001". You have few rejects. You can triple production runs with **Talide Carbide Dies** on your present equipment. For further information, write **Metal Carbides Corporation, Youngstown 7, Ohio.**





YOUR INQUIRY

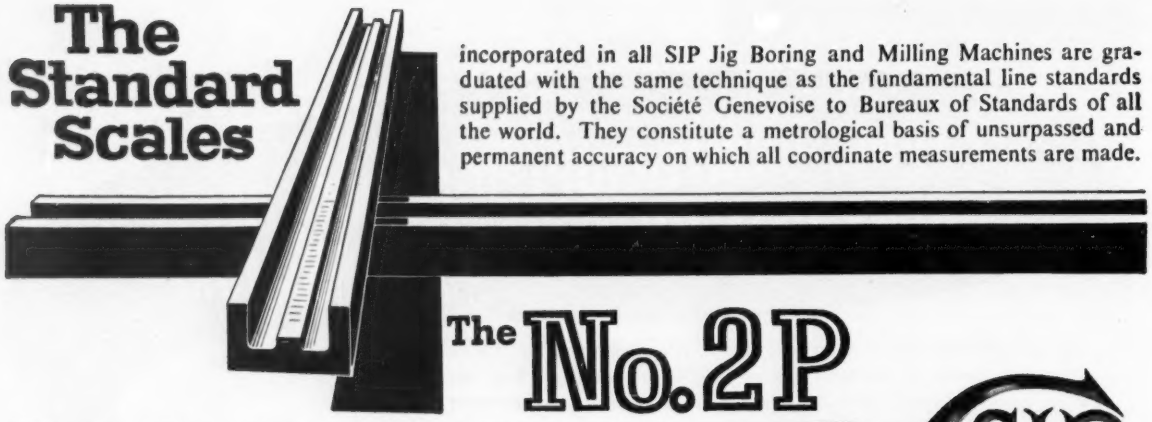
Prompt attention is given to all inquiries. Send us prints or parts for estimating and recommendation.
Ask for Catalog 52-G.

METAL CARBIDES CORPORATION
MC
TALIDE
YOUNGSTOWN 7, OHIO

SINTERED CARBIDES · HOT PRESSED CARBIDES
TUNGSTEN ALLOY HEAVY-METAL
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

The Standard Scales

incorporated in all SIP Jig Boring and Milling Machines are graduated with the same technique as the fundamental line standards supplied by the Société Genevoise to Bureaux of Standards of all the world. They constitute a metrological basis of unsurpassed and permanent accuracy on which all coordinate measurements are made.



The No. 2P

High Precision Jig Borer

SIP

comprises two standard scales at right angles to each other built into the cross-slides of the work-table. The graduations of the scales are viewed at a large magnification on

projection screens

grouped conveniently on the front of the machine and provided with adjustable setting indexes controlled by micrometer drums permitting coordinate values to be read to .0001 in.

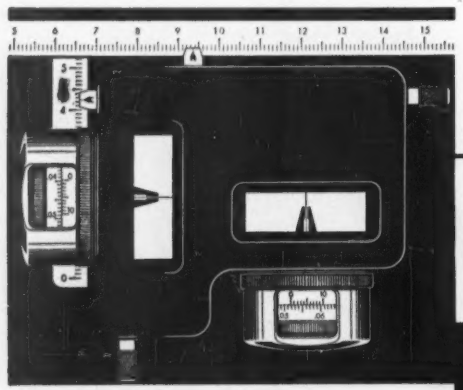
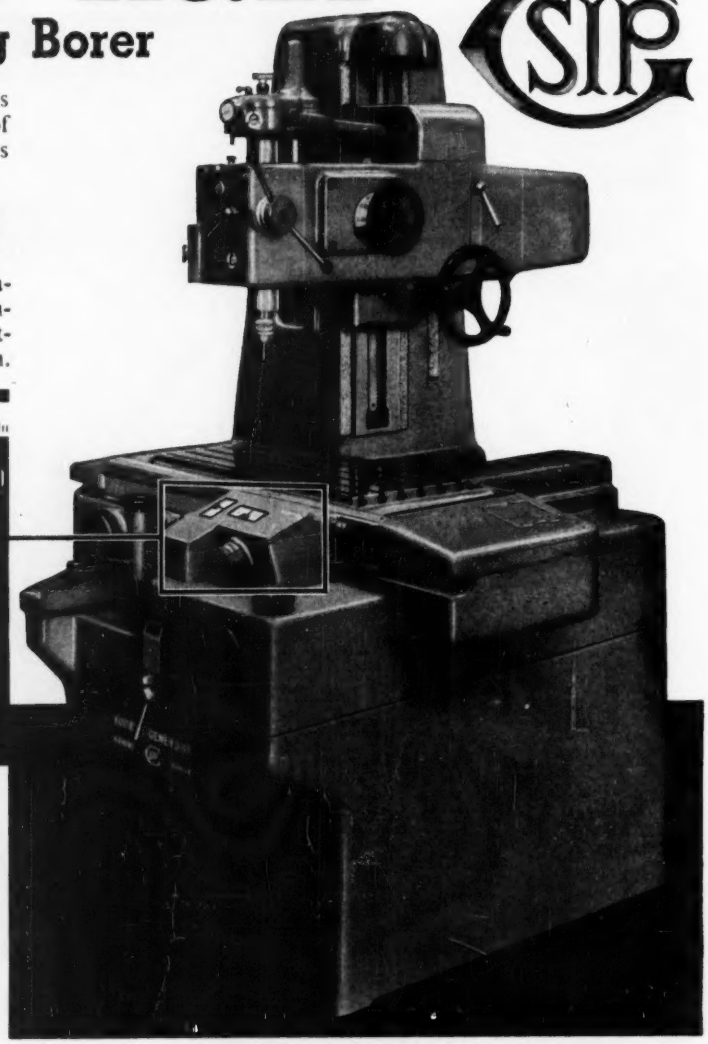


Table setting devices



SPECIFICATION

Working range	16″×10″
Table working surface	27 ½″×12 ½″
Table top to spindle end	19″
From spindle axis to column	13 3/8″
Spindle speeds	200 to 3000 rpm.
Boring capacity	1 9/16″
Spindle quill travel	5″
Net weight	3,750 lbs.

Guaranteed accuracy for all table settings: .0001 in.

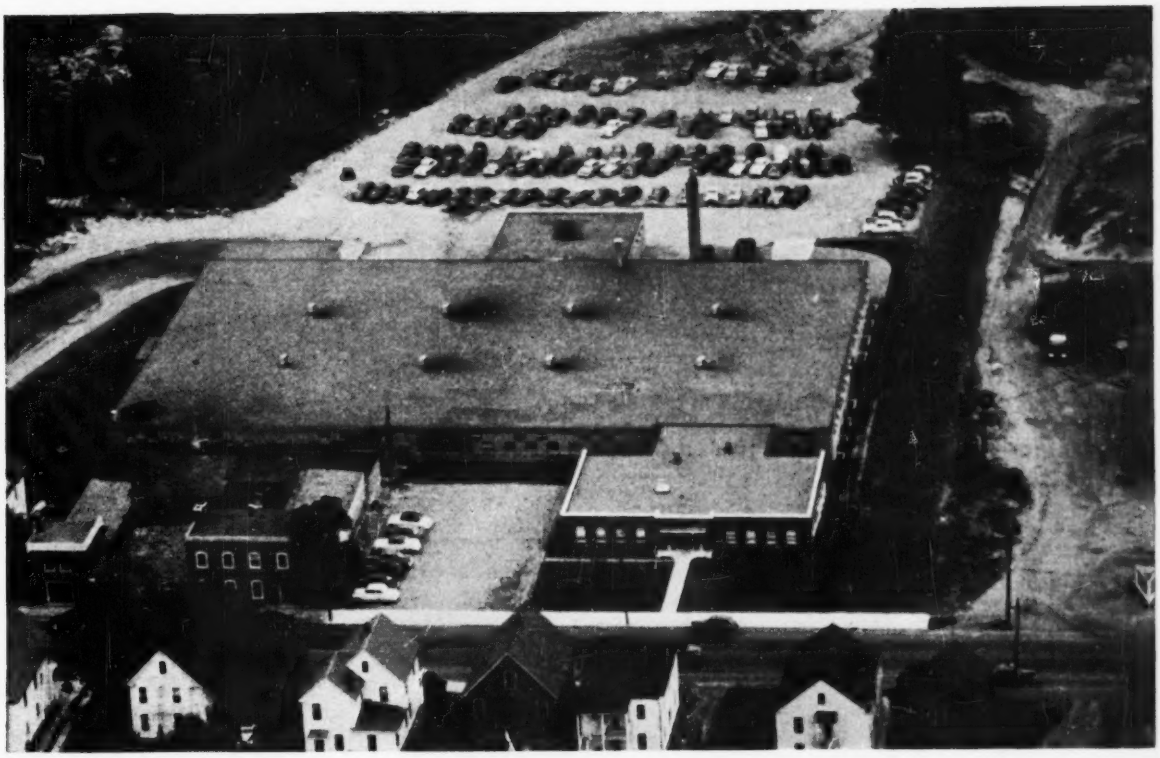
REPRESENTATIVE FOR U.S.A. AND CANADA:

AMERICAN SIP CORPORATION

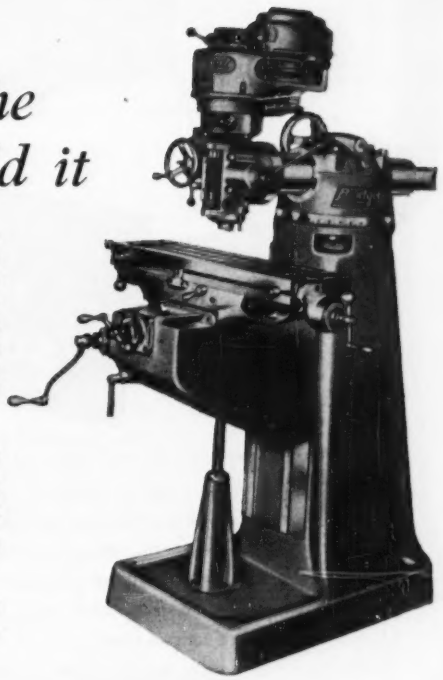
HIGH PRECISION MACHINE TOOLS AND MEASURING EQUIPMENT

100 East 42nd Street NEW YORK 17, N.Y.

A21



This is the House that "BRIDGEPORT" built and the Machine that helped to build it



Only 22 years ago... back in 1931... the first BRIDGEPORT High Speed Milling Attachment was delivered. Tremendous acceptance greeted this Attachment, so much so that it became necessary to produce a complete machine . . . The BRIDGEPORT TURRET MILLING MACHINE which was introduced in September, 1938. Since then, more than 16,000 "Bridgeport Millers" have followed this first one into the shops of the metal working industry. Then, too, an ever-increasing line of accessories has been developed and delivered to extend the utility of these popular machines.

The 22nd birthday of "BRIDGEPORT" finds this company in its modern, new plant on a five-and-a-half acre plot in Bridgeport... a plant that has been necessitated by the unprecedented acceptance of the machine on which production is concentrated... the BRIDGEPORT TURRET MILLING MACHINE which mills, drills, bores and shapes at all angles of the work on ONE setup.

Our new plant will enable us to accelerate manufacture of this machine and the accessories that make these machines more useful to industry.

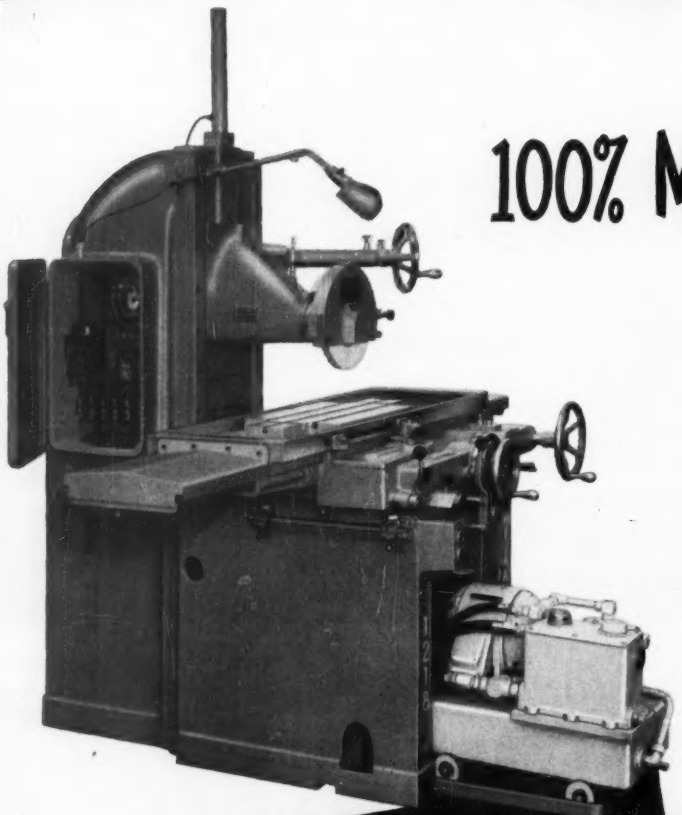
Ask for details of the "Machine that Built the Plant."

Bridgeport MACHINES, INC.

Bridgeport, Connecticut

Manufacturers of High Speed Milling Attachments and Turret Milling Machines

100% Modern



NO. 1218 HYDRABRASIVE SURFACE GRINDER

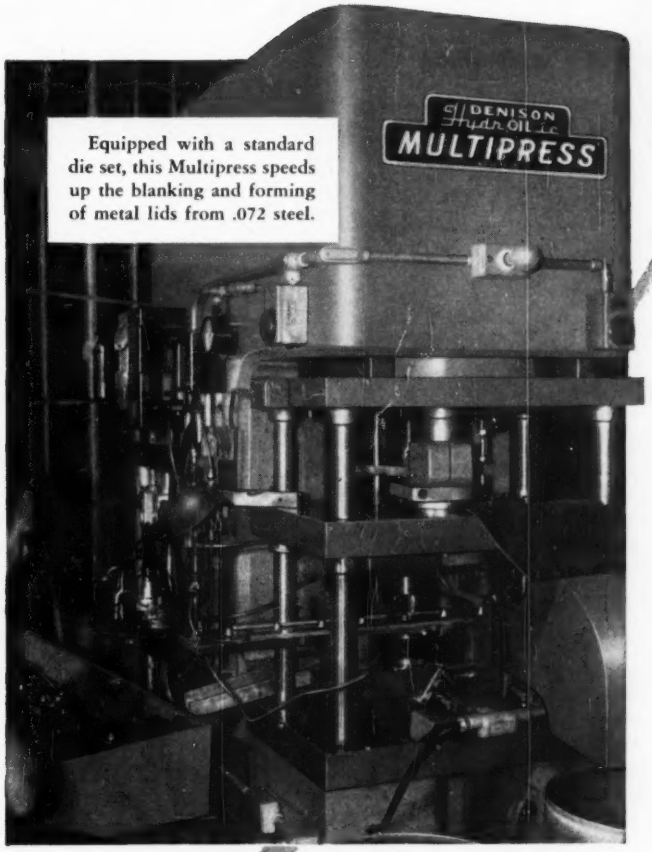
Beautifully modern yet accessible — that's the No. 1218 Hydrabrasive! There's none of the so-called "modern design" that's only window dressing, with operating parts blocked by streamline covers. On the No. 1218 notice how the hydraulic pump and tank unit rolls out on wheels for easy servicing. Also note the convenient electric control panel that fully meets J.I.C. codes. These are only two examples of Abrasive unit design that means complete accessibility.

The No. 1218 is built for today's high production grinding schedules. It speeds up all types of surface grinding, and its accuracy is a delight to operator and owner alike. Hydraulic operation provides table speeds from 1/2 to 90 ft. per min., with 3/8" of cross feed in 1/5 of a second. Specifications include: wide cross travel (12") and moderate table length (18"); saddle ball ways; and 3 HP spindle motor driving a standard 12" wheel. Write for latest complete catalog describing No. 1218 Hydrabrasive. Abrasive Machine Tool Co., 12 Dunellen Road, East Providence 14, Rhode Island.

ABRASIVE
ACCURACY BOOSTS PRODUCTION

Abrasive Quality is Reflected in the Finish of Your Product

"Blanking and Forming with MULTIPRESS"®



Equipped with a standard die set, this Multipress speeds up the blanking and forming of metal lids from .072 steel.

Multipress offers *lower* impact on dies . . . *lower* ram velocities.

Exact control of press tonnage cuts die wear, permits more grinds per die.

Infinitely adjustable ram stroke, plus easy inching action permits quicker die changes.

Fully adjustable tonnage, ram speed, and stroke length adaptable to a wider range of work.

Multipress offers one-ton to 50-ton capacities . . . eight frame sizes . . . bench and floor models . . . maximum accessibility for special tooling and auxiliary equipment.

Standard Multipress accessories available for many specialized production needs.

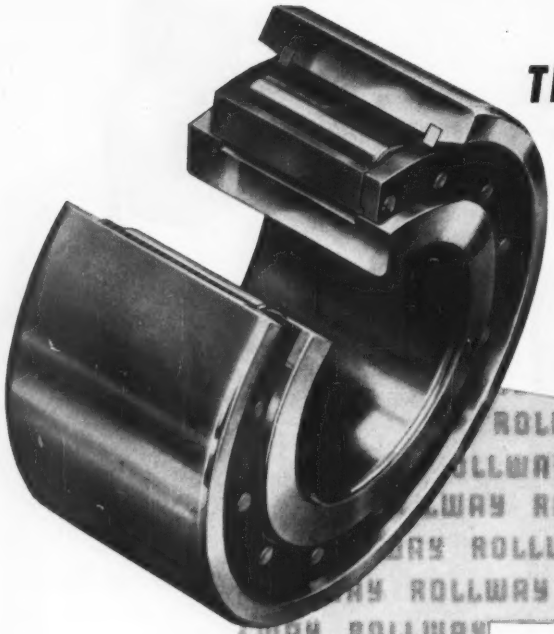
Write today for full information on Multipress.

See it in Action

Denison's newest film, "Blanking & Forming with Multipress" brings you 10 minutes of fast action on several actual production jobs . . . shows the *how* and *why* of methods and principles . . . highlights important press control features — *and gives you a close look at the fastest hydraulic press operation you've ever seen.* Your Denison Multipress representative can show you this new 16mm sound film now, or you may write direct to —

The DENISON Engineering Company
1152 Dublin Rd., Columbus 16, Ohio

DENISON HydrOILics



There's a growing preference for ROLLWAY BEARINGS ...and with good reason!

Unwavering right-line rotation—free of skew, side-shock and end-rub—greatly extends the life expectancy of a Rollway Roller Bearing. Add to longer life the definite gains in smoother operation and lower maintenance costs and it's understandable why, today, demand for Rollways has reached a new peak.

Our increased facilities are expanding Rollway output as fast as possible. We are continuing to improve the balance between supply and demand, so that service to both established and new customers will be geared to their quantity requirements . . . another reason why bearing users can confidently specify "The bearings that *roll* right because they're *made* right."

Our complete engineering and metallurgical services will gladly work with you on your problems. Simply write or wire any sales office. No cost. No obligation.

Rollway Bearing replacements are available through authorized bearing distributors in principal cities. Consult your classified 'phone directory.

ROLLWAY BEARING CO., INC.
SYRACUSE 4, N. Y.

RIGHT ANGLE

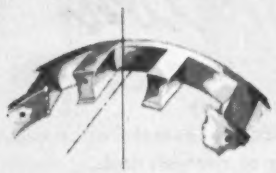
ROLLER ENDS, precisely square to avoid end-rub, oscillation and side-shock.

RIGHT ANGLE

BEARING SURFACES with parallelism that results in unwavering right-line rolling.

RIGHT ANGLE

SEPARATOR SLOTS accurately machined to prevent roller skew, slide and uneven wear.



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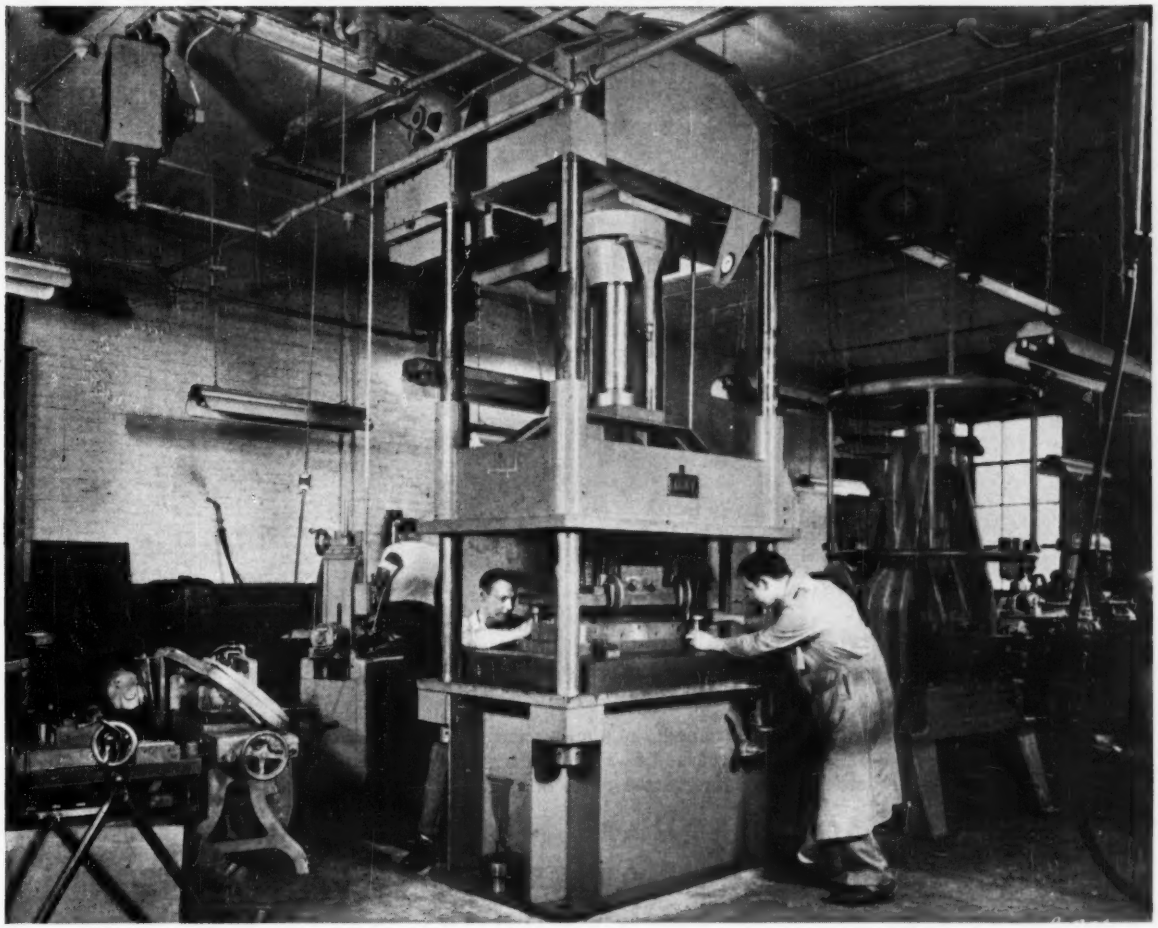
ROLLWAY BEARINGS

Complete Line of Radial and Thrust Cylindrical Roller Bearings



The diemaker who made a nuisance of himself

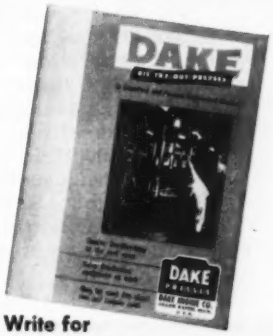
This is the story of Three Star Manufacturing Co.—a custom diemaker who serves a number of manufacturing plants in Chicago.

As in most such shops, his only means of trying out dies was a hand power screw press which sometimes needed six or seven men to get the needed pressure.

Large dies had to be tried out on his customers' production presses . . . which required drayage ($15 to $20 each way) and interruption of his customers' production. It meant both expense and nuisance to his customers and himself every time a die had to be tested.

Now he has ended the nuisance by installing the press shown above in his own shop. It not only saves time and money, but avoids the embarrassment of having workers in his customers' plants see and know that occasionally a die must be taken back for adjustment.

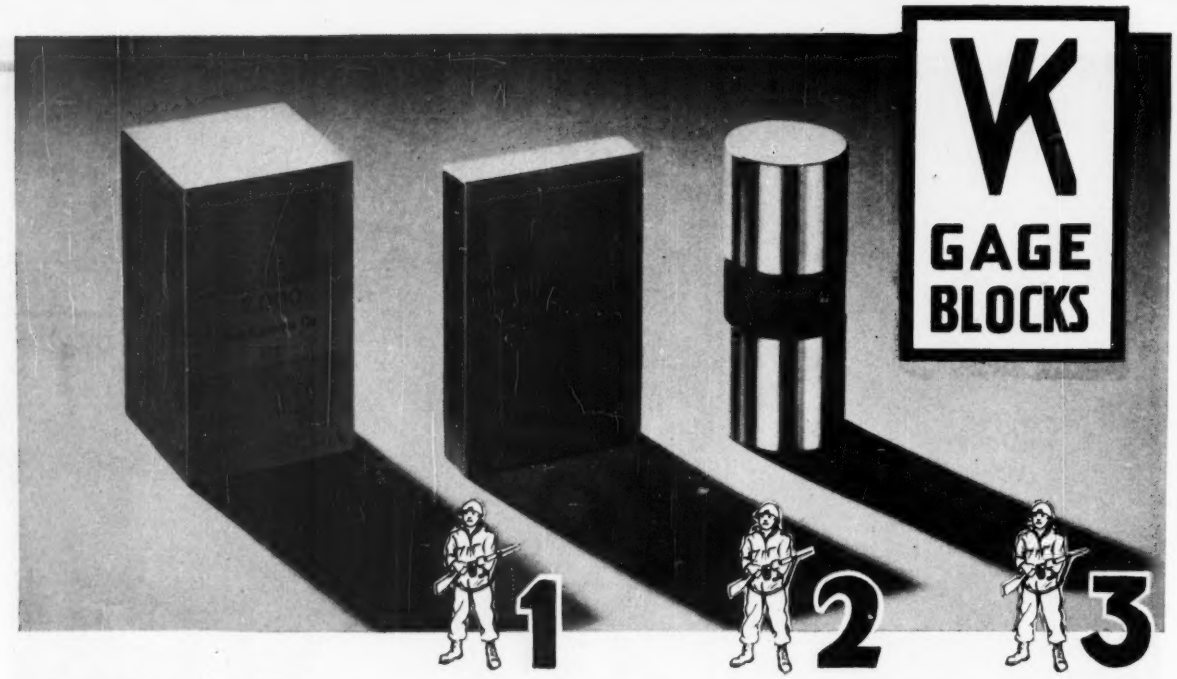
Specifications for single-acting and double-acting die tryout presses in ten air-operated and sixteen electrically operated models are contained in Bulletin 267—sent gladly on request.



Write for Bulletin 267

Dake Engine Company, 604 Seventh St., Grand Haven, Mich.

DAKE PRESSES



SOLDIERS THREE ... *defending production accuracy*

To meet the requirements of the current defense effort in meeting closest limits of accuracy and protecting production, Van Keuren is currently furnishing three types of gage blocks:

1–SOLID SQUARE MASTER BLOCKS
2–RECTANGULAR REFERENCE GAGES
3–MICROGAGES

Shipment on complete sets of any of these three types can be made within 60 days from receipt of order.

VK Solid Square Master Blocks are accurate to .000004" per inch of length and are designed for laboratory use or to standardize all shop dimensions. Large wearing surface; perfect parallelism. Available in 85- and 41-block sets and guaranteed unconditionally for 5 years not to exceed .0001" in wear.

VK Rectangular Reference Gages are guaranteed accurate to .000008" per inch of length and are designed for the inspection department or precision set-up work. They are available in 81-block and 33-block sets. Individual blocks from either of these sets can also be furnished. Certificate of size is also furnished with each set.

VK Microgages are accurate to plus .000012", minus .000008" per inch of length and are designed as working gages for shop use—to put accuracy at the machine. Wearing surface is 40% greater than that of rectangular gage blocks, hence their long-wearing quality. Available in several set combinations.

Van Keuren Gage Blocks are fully described in Catalog and Handbook No. 35, yours for the asking by writing: The Van Keuren Co., 178 Waltham St., Watertown, Mass.

VK
34th YEAR

THE *Van Keuren* CO.

178 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires

Designed for those who need LIGHT-HEAVYWEIGHT Machines

New 16″ and 14″ Band Saws by WALKER-TURNER

For jobs where neither the capacity nor expense of a heavy industrial machine is warranted, and where a "hobby machine" would be wholly inadequate, Walker-Turner has engineered a special class of *light-heavyweight* Band Saws.

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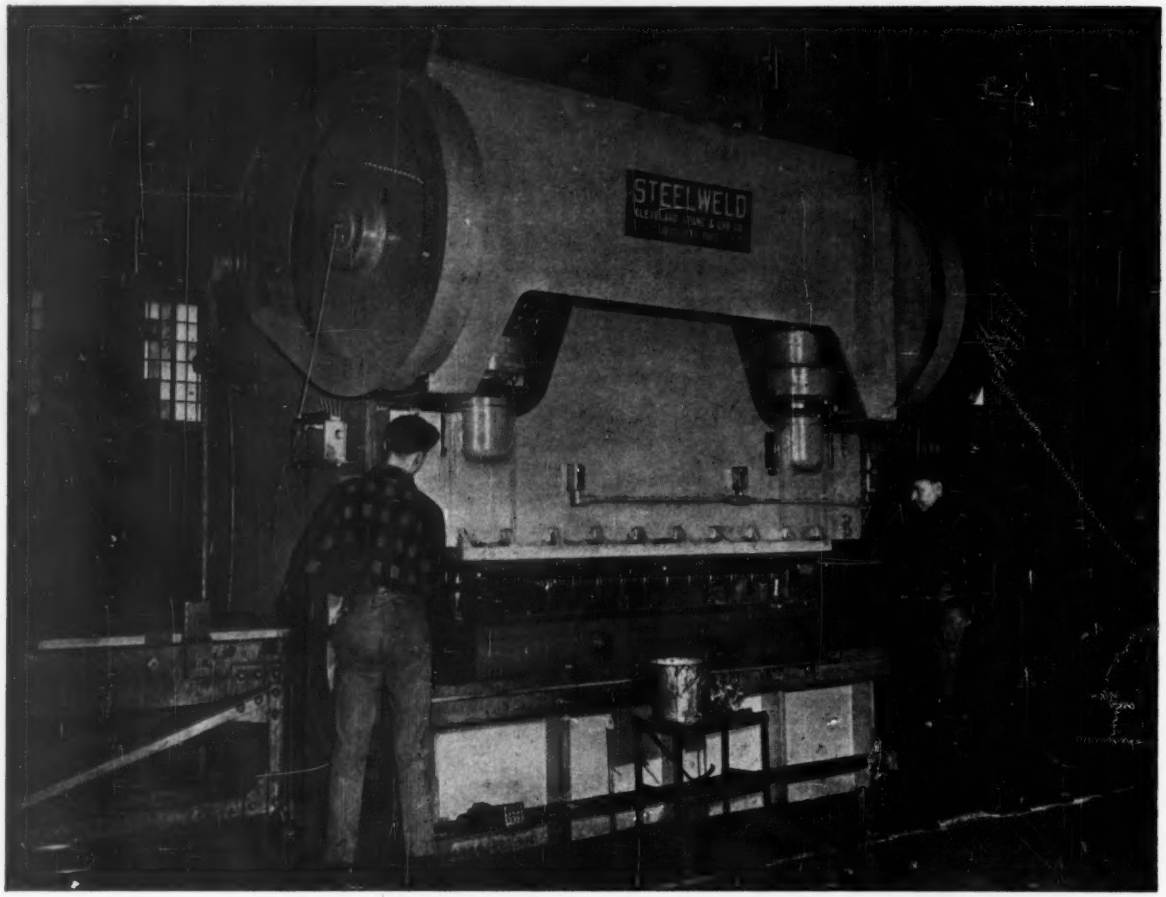

Model K5-8 Press, one of two Steelwelds in continuous 24-hour service since 1945, punching a series of holes in bridge floor bars.

2,000 Bars slotted every 8-Hour shift

Although originally conceived as machines for bending metal, Steelweld Presses are now serving a wide variety of uses. Two large Steelwelds at the MacDonald, Ohio Plant of the Carnegie-Illinois Steel Corporation are used solely for punching slots in steel bars, beams and T-sections for bridge flooring.

The time of one press is devoted largely to punching slots in bars 1⅝" and 1-7/16" wide by ¼" thick by 6'-2" long. Each bar contains 13 slots ½" wide by ⅝" to ⅞" long, and 24 slots ¼" wide by ⅝" to ⅞" long, a total of 37 slots all punched at one time. Two thousand bars are slotted in an eight hour shift.

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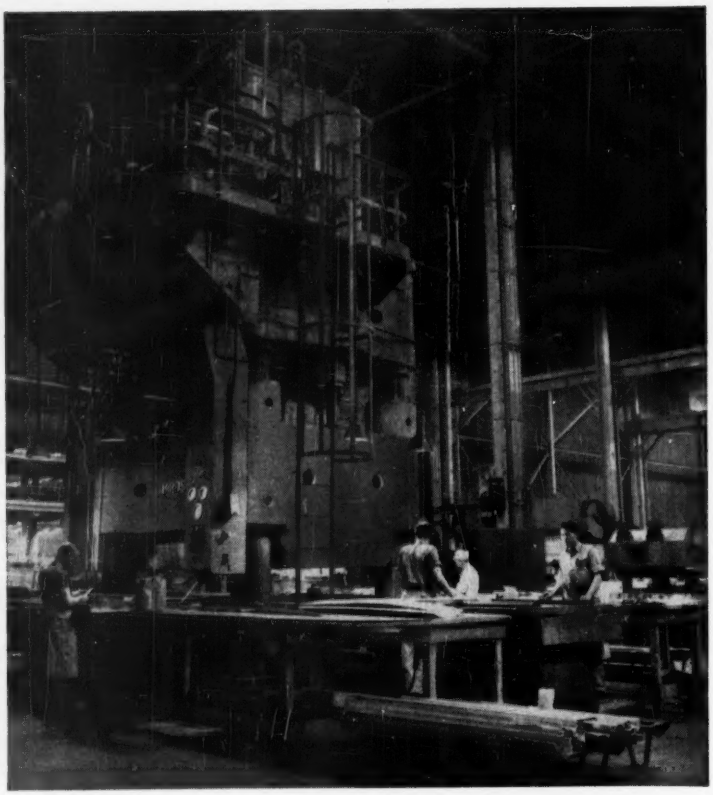

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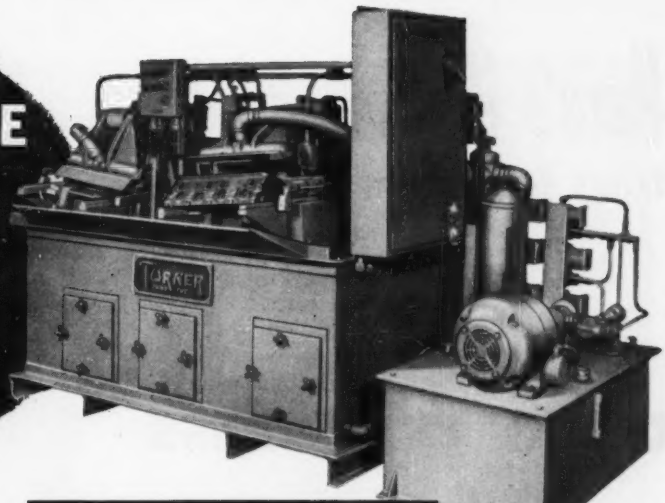
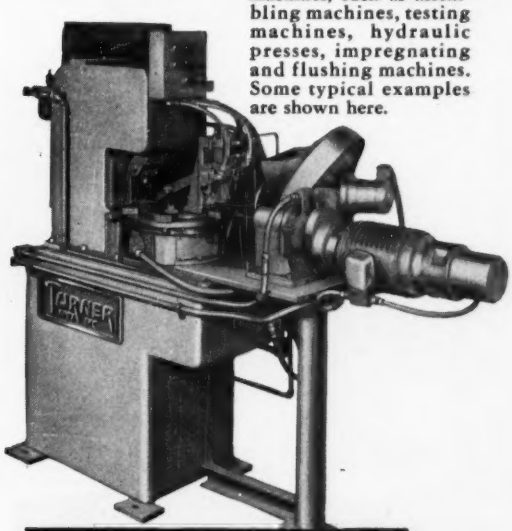


Flush-Out Machine

Multiple cylinder head flush-out machine for testing and washing sand and chips from semi-machine cylinder heads. Cylinder head is placed in one side of machine, tripping limit switches, and when operator presses buttons, fixture closes, water pressure is automatically applied to fixture and forced into all openings that are not sealed in cylinder head. Water is flushed through all cavities in cylinder head for wash purposes. Pressure of water is equal to a 3" stream forced 90 feet into the air. During the sequence of this operation, operator is unloading and loading other fixture on machine. Note two palm buttons for operator safety.

Turner Bros. are primarily known for designing and building special indexing, transfer and trunnion type drilling, reaming, tapping and milling machines. They also design and build other types of special purpose machines, such as assembling machines, testing machines, hydraulic presses, impregnating and flushing machines. Some typical examples are shown here.



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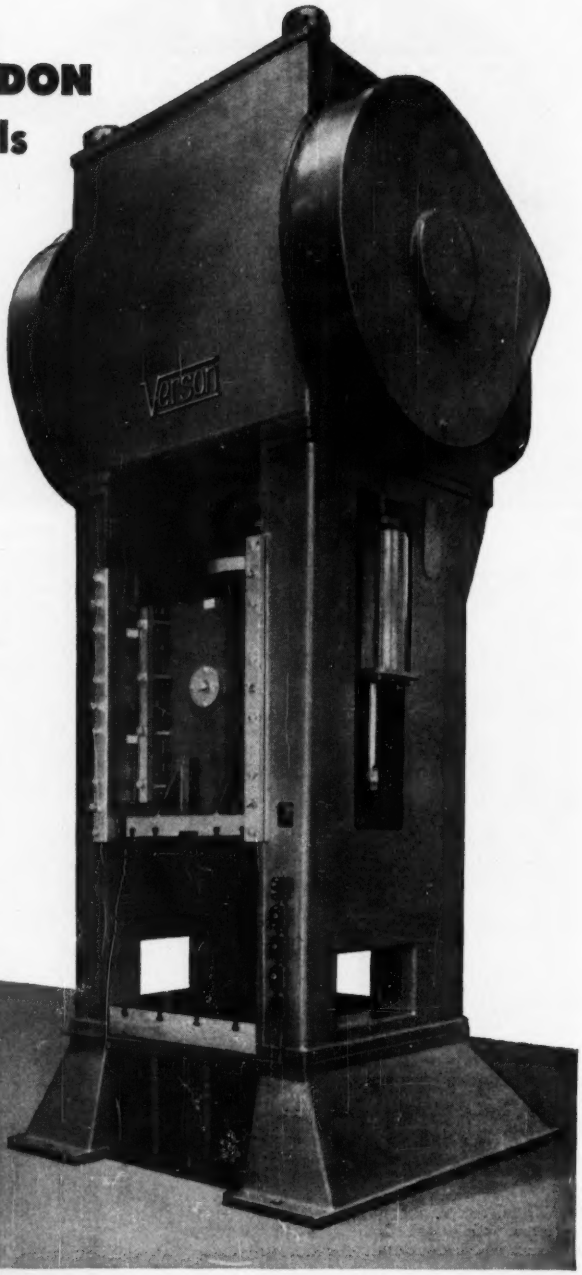

Illustrated above is the 600 ton Verson single crank, single action, double gear twin drive press. Bolster area, F.B. x R.L., is 56" x 48". At left the piece being removed from the press after trimming.

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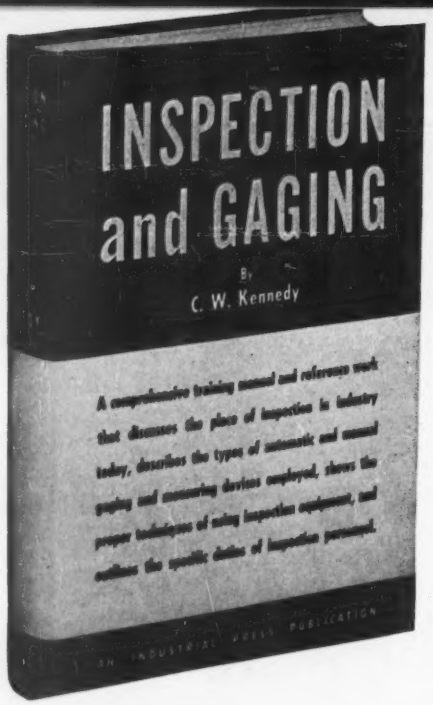

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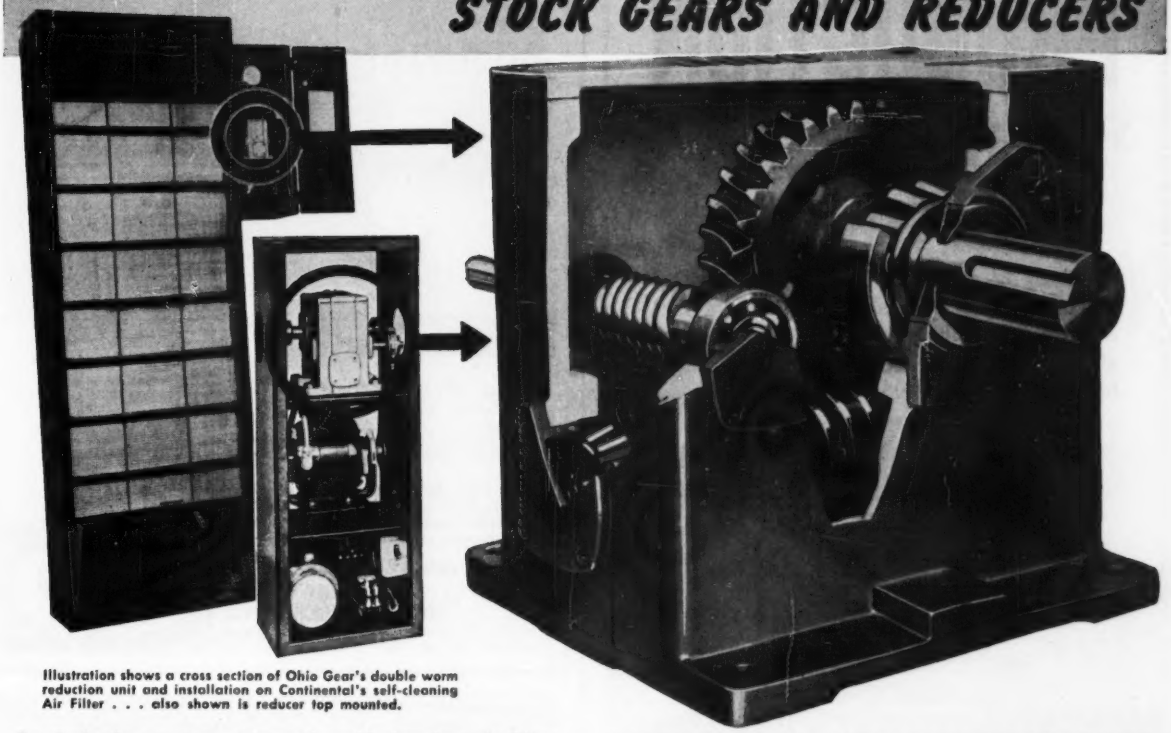

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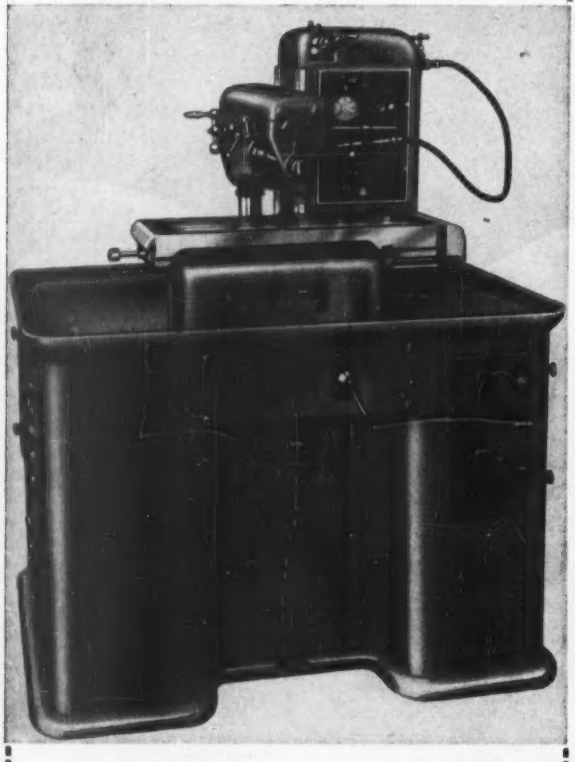

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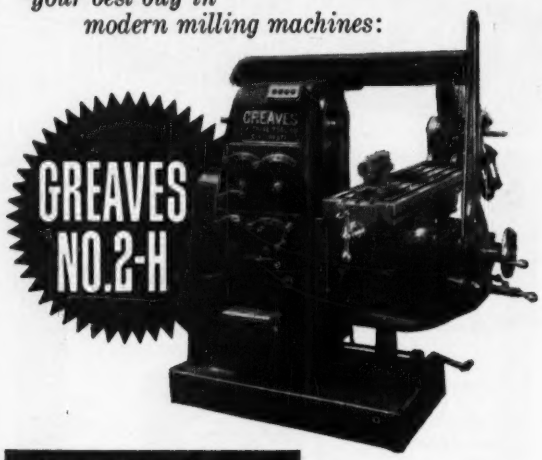

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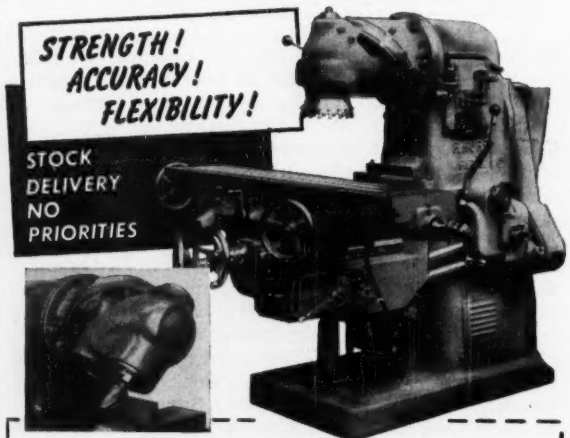

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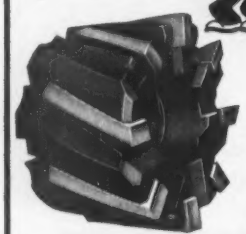

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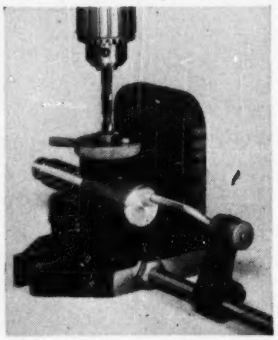

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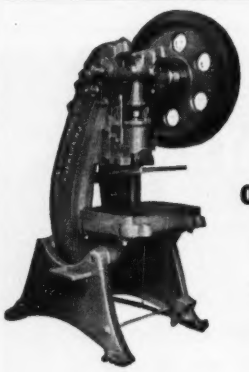

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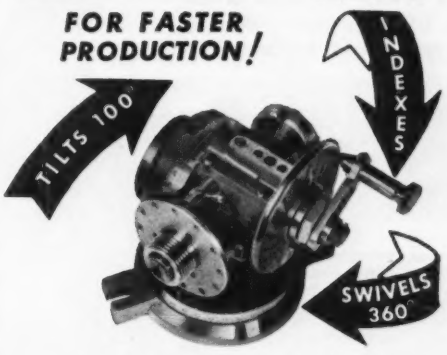

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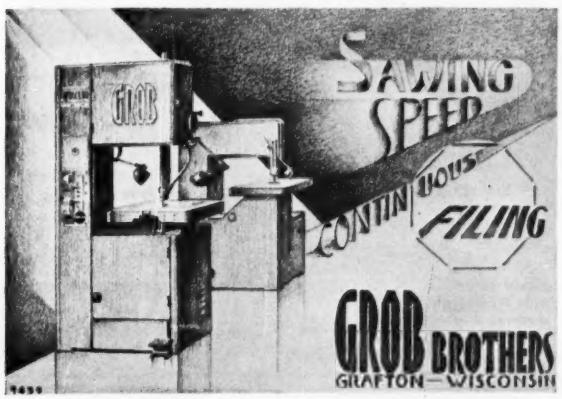

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	Long. table speed, infinitely variable FPM	55'
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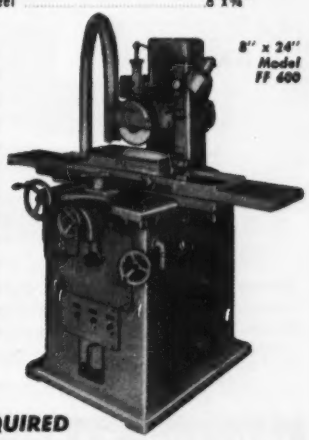

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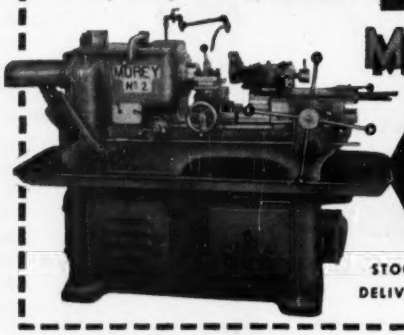

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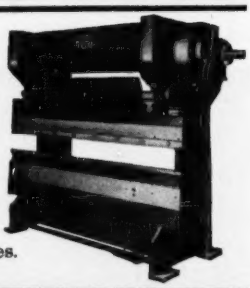

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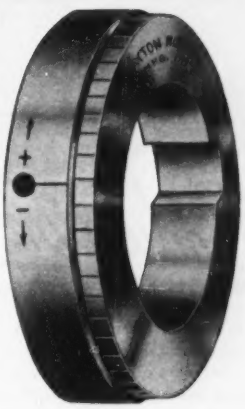

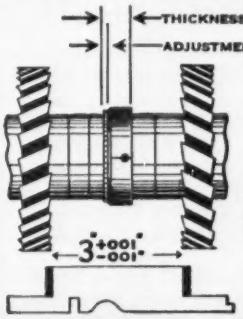

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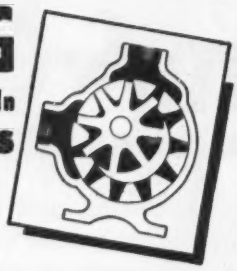

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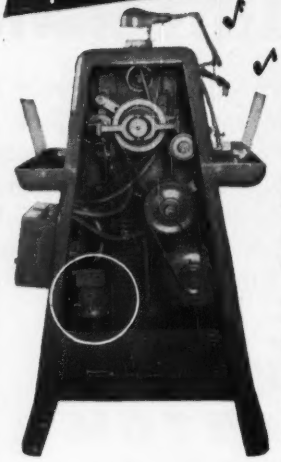

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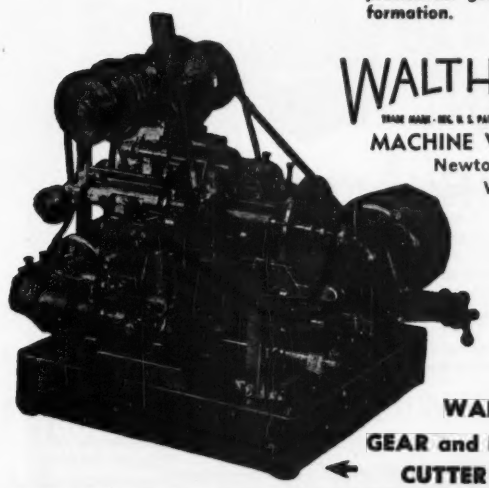

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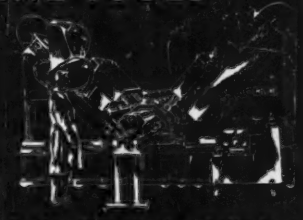

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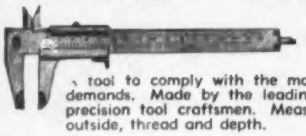

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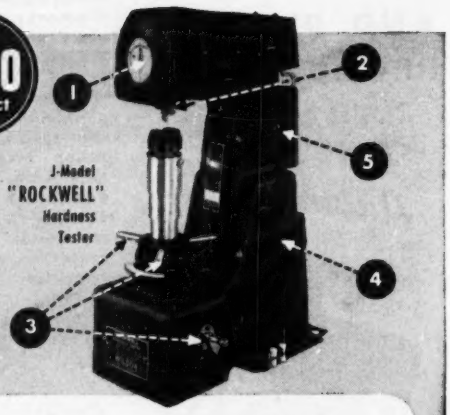

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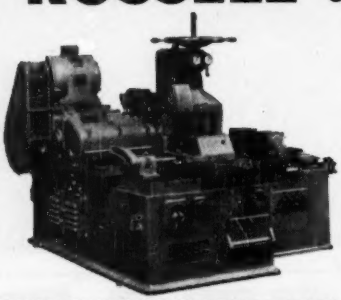

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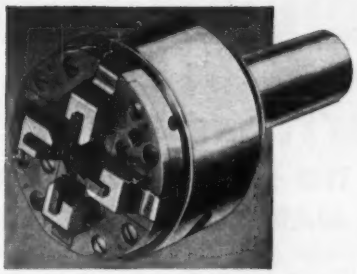

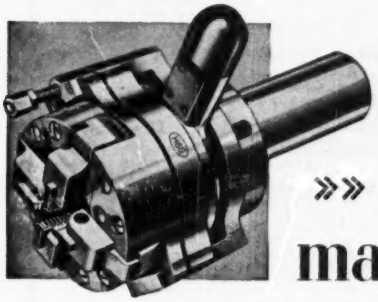

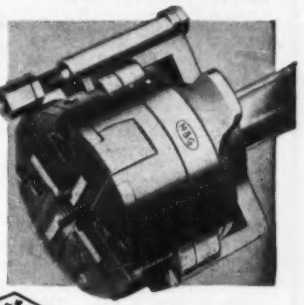

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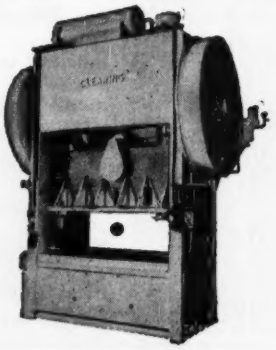

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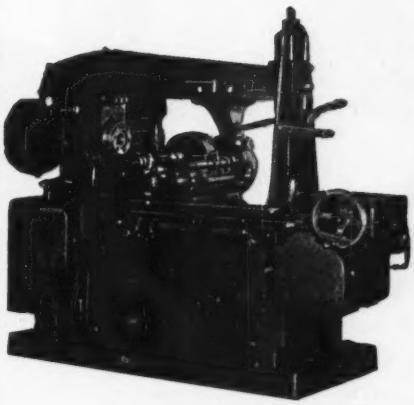

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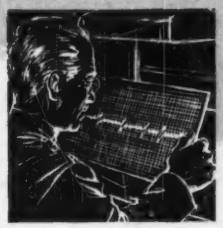
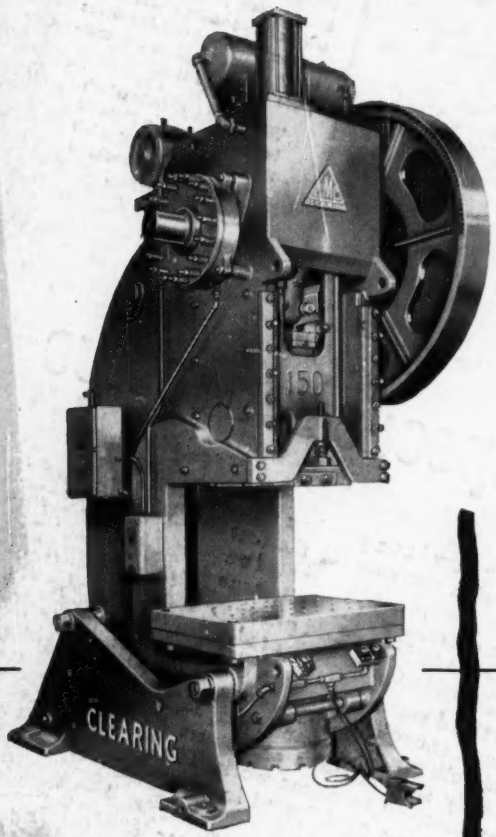
Cleveland manufactures worm gearing and worm gear speed reducers in a wide range of types and sizes, large and small, to meet the requirements of any machinery builder or user. Write today for Catalog 400. The Cleveland Worm and Gear Company, 3276 East 80th Street, Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers, Limited.

An Electrocardiogram for an O.B.I.?





What if doctors could re-design the human body? Maybe the first thing they'd do is strengthen the heart—fix it so it wouldn't give out before its time. A tough job for the doctors, but with presses it's a different matter. Because for years that's essentially the kind of treatment open back inclinable presses have had from Clearing engineers.

That's why the frames are all steel weldments, with more rugged bearings, pitman connections and adjustments. Clearing designers have analyzed functional disorders and engineered preventive maintenance into the press. So if you're looking for presses that stay young and trouble-free longer, find out about Clearing inclinables.

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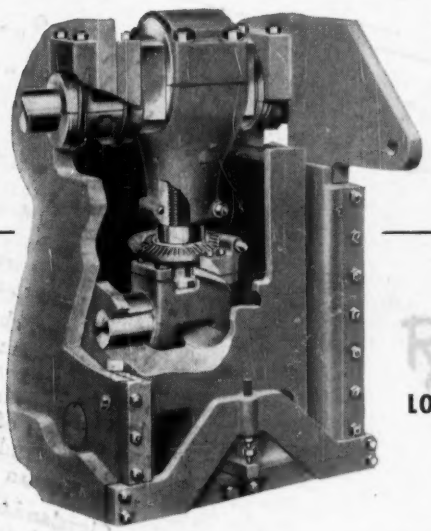
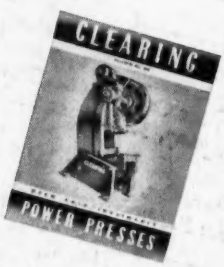


Illustrations on this page are of the Clearing 150 ton inclinable press.

Rx **FOR A LONG, USEFUL LIFE**



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1. **FRAME**—All steel welded, fully stress relieved. Ample reinforcing at critical points.
2. **BEARINGS**—Long wearing bronze. Split cartridge type for easy servicing.
3. **ADJUSTMENT**—Adjustment screw buttress threaded for greater strength. Easy to adjust in fine increments.
4. **CONNECTION**—Wrist pin supported from below eliminates shear stresses. Unique construction keeps dirt out of bearing surfaces.
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